Engineering Report

Beaver Dam UTILITIES

City of Beaver Dam

Adaptive Management Plan

July 2019

Applied Technologies
Engineers - Architects

PN6086

ADAPTIVE MANAGEMENT PLAN

CITY OF BEAVER DAM

JULY 2019

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PN6086

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SECTION 1
EXECUTIVE SUMMARY

The City of Beaver Dam (City) was required to submit a Final Compliance Alternatives Plan (CAP) by April 30, 2019, which was performed to evaluate a variety of alternatives capable of ensuring permit compliance. The Final CAP provided a summary of the alternatives considered and a roadmap toward implementing Adaptive Management in the Beaver Dam Watershed. This report presents the Adaptive Management Plan.

Partnerships were established in the watershed, including a critical partnership with the Beaver Dam Lake Improvement Association. The Beaver Dam Watershed was defined as Reaches 34, 33, 82, and 32 of the Rock River Total Maximum Daily Load (TMDL). The watershed was described and characterized. Agriculture is the dominant land use within the Beaver Dam Watershed, and several phosphorus loss reduction practices were identified to be compatible with corn production.

To prioritize areas for new practices and installations, critical source areas (CSAs) were identified. These include crop fields in the Beaver Dam Creek Subwatershed, shorelines and bays within Beaver Dam Lake, and other locations recommended by the Dodge County Land and Water Conservation District. The total annual target phosphorus reduction was determined to be approximately 7,400 pounds per year. Improved effluent quality at the City of Beaver Dam Wastewater Treatment Plant will likely comprise a major portion of the target phosphorus reduction. Nonpoint source reductions are anticipated to be critical to achieving the target, including cover crop adoption, no-till practices, carp management, and shoreline protection on Beaver Dam Lake.

Project success will be defined by improved water quality and financial viability for the City of Beaver Dam. These metrics will be evaluated annually, with the Adaptive Management approach being assessed before each new permit term. Adaptive Management is anticipated to be the lowest cost compliance option for the City of Beaver Dam. Relying on strong partnerships, the City of Beaver Dam is eager to do its part to meet the goals set out in this Adaptive Management Plan.

SECTION 2
INTRODUCTION

The City of Beaver Dam (City) owns and operates a 5.5 mgd wastewater treatment plant (WWTP) in Dodge County, Wisconsin. The current average flow is 4.3 mgd, and the current effluent phosphorus concentration is approximately 0.8 mg/L. When the Rock River Total Maximum Daily Load (TMDL) allocations were introduced, the City would have been required to meet effluent limits ranging from approximately 0.04 to 0.06 mg/L under design year flows. The City discharges to the Beaver Dam River (Reach 34), which is downstream of Beaver Dam Lake. The original TMDL was contested and revised when it was determined that that the load allocations from Beaver Dam Lake to Reach 34 were errant. The TMDL allocations were revised by the Wisconsin Department of Natural Resources (WDNR), and these revisions were approved by the United States Environmental Protection Agency (USEPA) on August 17, 2018.

The new phosphorus TMDL allocations will result in limits ranging from approximately 0.16 to 0.75 mg/L based on anticipated design year flows. Compliance with the revised TMDL is required by July 2023. In anticipation of this lower limit, the City's current Wisconsin Pollutant Discharge Elimination System (WPDES) permit includes a phosphorus compliance schedule. The compliance schedule requires the City to complete several actions to evaluate alternatives and achieve compliance.

The City was required submit a Final Compliance Alternatives Plan (CAP) by April 30, 2019. The Compliance Alternatives Plan was performed to evaluate a wide variety of compliance alternatives capable of ensuring permit compliance. The Final CAP provided a summary of the alternatives considered and a roadmap toward implementing Adaptive Management in the Beaver Dam Watershed. This report presents the Adaptive Management Plan.

ADAPTIVE MANAGEMENT

Adaptive Management (AM) presents a unique opportunity for the City to demonstrate compliance with its permit. With AM, the City would work with partners to reduce phosphorus loadings in the Beaver Dam Watershed, defined as Reaches 34, 33, 82, and 32 of the Rock River TMDL. Through both point and non-point load reductions over several permit terms, the City will seek to achieve the total phosphorus (TP) water quality criterion (WQC) of 0.075 mg/L at the bottom of Reach 34, which is the point of compliance.

IDENTIFY PARTNERS

A successful Adaptive Management Plan relies of strong partnerships. Fortunately, the Beaver Dam Watershed already has many active parties interested in water quality improvement. By accessing local knowledge, coordinating with other governmental organizations, and reaching out to non-governmental groups, these strong partnerships can foster strong relationships with stakeholders and lead to improved outcomes.

Several past research studies focused on water quality within the Beaver Dam Watershed. The Beaver Dam Lake Improvement Association, in collaboration with the City, Columbia County LWCD, and the WDNR, has led sampling and watershed improvement efforts for decades. Phosphorus concentrations, flowrates, and other water quality parameters were measured at several sites throughout the watershed, as detailed in Section 3. Sampling continued through 2017 with researchers from the University of Wisconsin–Madison. With their continued leadership in the watershed, the Beaver Dam Lake Improvement Association is a critical partner.

Many organizations were contacted as potential Adaptive Management partners. The table below summarizes the proposed roles and responsibilities of all partners. Letters of support are included in the Appendix from key partners.

Table 2-1 Adaptive Management Partners	
Partner	Role / Responsibilities
City of Beaver Dam* (City)	Lead partner for Adaptive Management project.
	Coordinate project efforts, define scope.
	Establish schedule for proposed projects.
	Source of financial assistance for improvements and new practices.
	Coordinate search for external funding.
Beaver Dam Lake Improvement Association* (BDLIA)	Identify opportunities for phosphorus reductions in the watershed.
Applied Technologies, Inc.* (ATI)	Provide technical assistance for City's wastewater treatment facility.
	Provide technical assistance to the City for implementing and quantifying phosphorus reductions in the watershed.
	Support efforts to complete grant proposals and cost-share applications.
Clean Wisconsin	Provide technical assistance, public outreach, and public education related to the Adaptive Management project.
	Coordinate efforts and practices with other Adaptive Management projects in Wisconsin.
Columbia County Land and Water Conservation Department* (LWCD)	Provide technical assistance, regulatory oversight, and review of implemented practices in Columbia County.
	Evaluate current and future landowner compliance with Wisconsin's agricultural standards and limits from NR 151.
Dodge County Farmers For Healthy Soil Healthy Water* (FHSHW)	Identify possible opportunities for phosphorus reductions in the watershed.
Dodge County Land and Water Conservation Department* (LWCD)	Provide technical assistance, regulatory oversight, and review of implemented practices in Dodge County.
	Evaluate current and future landowner compliance with Wisconsin's agricultural standards and limits from NR 151.
MSA Professional Services (MSA)	Provide technical assistance for the City of Beaver Dam's municipal separate storm sewer system (MS4).

United States Department of Agriculture (USDA) - Farm Services Agency (FSA) and Natural Resources Conservation Service (NRCS)	Provide technical assistance and financial assistance for the Adaptive Management Project.
	Support enrollment in USDA programs with cost-share/funding such as the Environmental Quality Incentive Program (EQIP) and the Regional Conservation Partnership Program (RCPP) to implement BMPs as part of the Adaptive Management Project.
Wisconsin Department of Natural Resources (WDNR)	Provide regulatory oversight for the Adaptive Management Project.
	Coordinate directly with the City regarding compliance with effluent limits at the wastewater treatment facility and progress with implementing the Adaptive Management Plan

Note: Asterisks indicate key partners.

Other potential partners are listed below. Although these groups have not yet agreed to partner on the Adaptive Management project, these groups will continue to be engaged by the City to identify possible opportunities for phosphorus reductions in the watershed and to best leverage external funding sources for the project:

- Aldo Leopold Chapter of Trout Unlimited
- American Farmland Trust
- Clean Water Association
- Columbia County Pheasants Forever
- Fox Lake Preservation Association
- Rock River Coalition
- Sand County Foundation
- Southern Chapter of Trout Unlimited
- University of Wisconsin – Extension
- University of Wisconsin – Nelson Institute for Environmental Studies
- Wisconsin Department of Agriculture, Trade, and Consumer Protection
- Wisconsin Ducks Unlimited, Inc
- Wisconsin Land and Water Conservation Association

SECTION 3
WATERSHED INFORMATION

The City of Beaver Dam (City) owns and operates a wastewater treatment plant (WWTP) that discharges to the Beaver Dam River in Reach 34 of the Rock River TMDL. The Beaver Dam Watershed is comprised of Reach 34, as well as three upstream reaches: Reach 33, Reach 82, and Reach 32.

ADAPTIVE MANAGEMENT ELIGIBILITY

To be eligible for Adaptive Management, the City must meet at least one of several criteria. Based on the WDNR's guidance, the City should either be in a nonpoint source-dominated watershed, in a watershed with an approved TMDL, or in a watershed where nonpoint sources must be controlled to meet water quality goals.

The City is eligible for Adaptive Management because the Beaver Dam Watershed was determined to be nonpoint source-dominated. This determination was based on the WDNR's Pollutant Load Ratio Estimation Tool (PRESTO). The City is the sole point source facility discharging within Reach 34 of the Rock River TMDL. The Village of Randolph, located upstream in Reach 33, is the only other point source in the Beaver Dam Watershed (Reaches 34, 33, 82, and 32). The PRESTO report estimated that point sources contributed only 16% of the total phosphorus loadings within the Beaver Dam Watershed, with the vast majority (84%) of phosphorus loadings contributed by nonpoint sources.

Moreover, the City demonstrated its eligibility for Adaptive Management because it is subject to the Rock River TMDL. All EPA-approved TMDLs were pre-determined to require pollutant reductions from both point and nonpoint sources to meet water quality goals. Consequently, the City is eligible for Adaptive Management.

REQUIRED LOAD REDUCTIONS – ROCK RIVER TMDL

The Rock River TMDL was completed by the WDNR and approved by the United States Environmental Protection Agency (USEPA) in 2011. In 2018, the USEPA approved a revision to the TMDL that focused on the Beaver Dam Watershed. Using these documents and other WDNR guidance, the required load reductions were estimated.

The appendices of the Rock River TMDL presented Total Phosphorus allocations (Appendix J) as well as estimates of the percent reductions required to meet the WQC (Appendix H). From these tables, the baseline loadings in the Beaver Dam Watershed could be calculated by dividing the values in Appendix J (Total Phosphorus Allocations) by the values in Appendix H (Required Percent Reduction of TP from Annual Baseline Load). A summary of these values is included in Table A-2 of Appendix A.

The City's baseline annual effluent phosphorus loading was estimated to be approximately 11,000 lb/yr. By comparison, the TMDL allocation to the City is 6,513 lb/yr, and an achievable effluent phosphorus concentration of 0.4 mg/L would lead to an approximate effluent loading of 5,239 lb/yr under current flows and 6,701 lb/yr under design flows. Consequently, increased chemical addition is expected to reduce average effluent phosphorus loadings from the City by more than 50% compared to the baseline levels.

By comparison, the Rock River TMDL estimated total baseline annual phosphorus loadings throughout the Beaver Dam Watershed to be 20,100 lb/yr, with total Beaver Dam Watershed allocations totaling approximately 12,700 lb/yr. Therefore, the Rock River TMDL estimated that a total of approximately 7,400 lb/yr in reductions will be necessary to achieve the WQC in the Beaver Dam Watershed.

WATERSHED DESCRIPTION AND INVENTORY

The Beaver Dam Watershed is defined by four reaches of the Rock River TMDL: Reaches 34, 33, 82, and 32, as listed in Table 3-1. As shown in Figure 3-1, the Beaver Dam Watershed also includes five subwatersheds, each defined by its 12-digit hydrological unit code (HUC12). The Beaver Dam Watershed spans more than 101,000 acres and four counties, as detailed in Table 3-2.

Table 3-1
Beaver Dam Watershed
Rock River TMDL Reaches and HUC12 Subwatersheds

TMDL Reach	Acres	% of Watershed	Subwatersheds	HUC12
34	1,742	2%	Beaver Dam River	070900010908
33	40,314	40%	Beaver Dam Lake	070900010904
	20,307	20%	Beaver Creek	070900010903
82	29,882	30%	Fox Lake	070900010902
32	8,922	9%	Alto Creek	070900010901
Total	**101,166**	**100%**	**Beaver Dam Watershed**	**-**

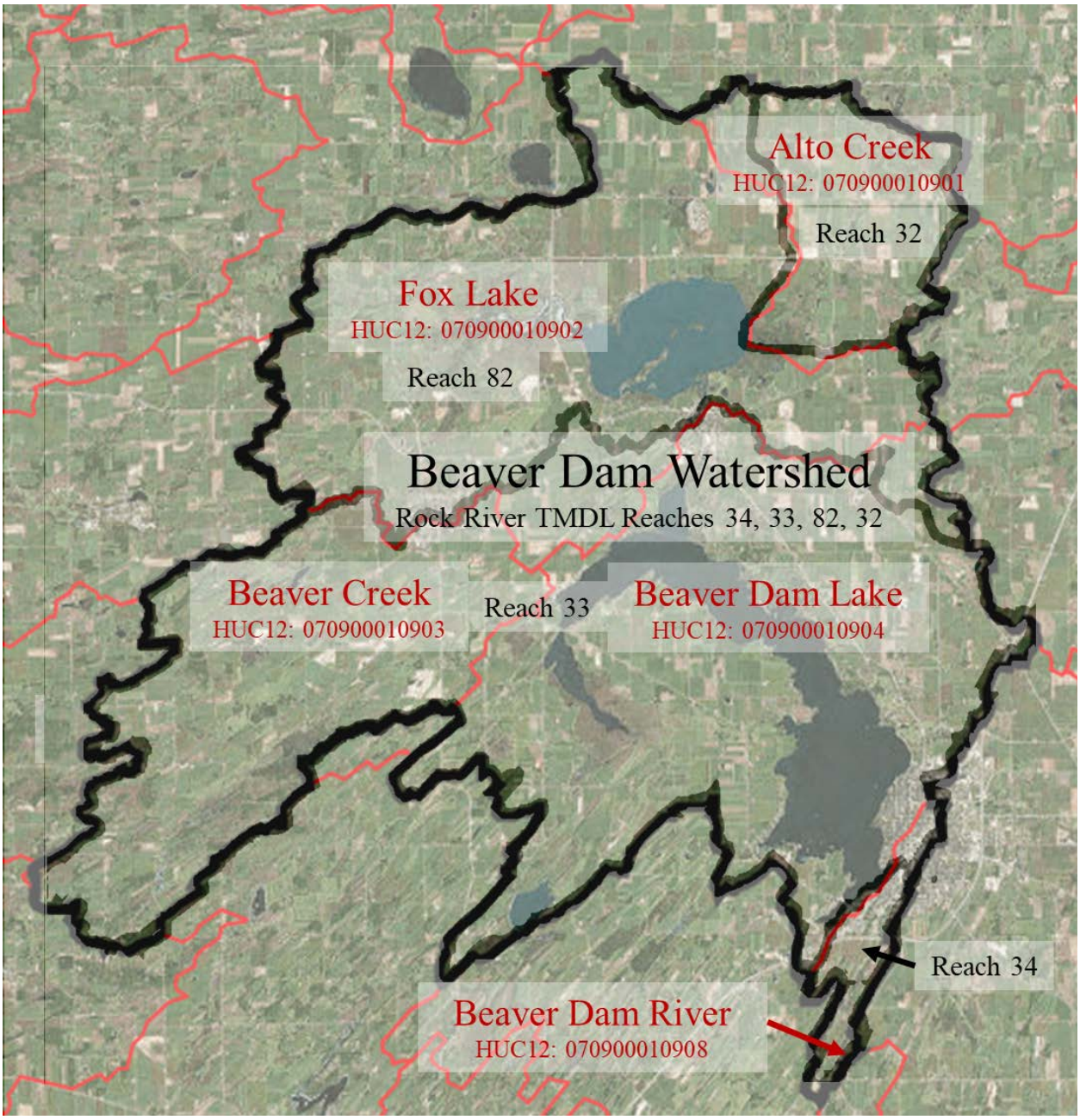
Source: WDNR Watershed Restoration Data Viewer, PRESTO, Rock River TMDL

Table 3-2
Beaver Dam Watershed
Acreage by County

County	Acres	% of Watershed
Dodge County	73,837	73%
Columbia County	24,455	24%
Green Lake County	1,877	2%
Fond du Lac County	997	1%
Total	**101,166**	**100%**

Source: USDA Web Soil Survey

Figure 3-1
Beaver Dam Watershed
Rock River TMDL Reaches and HUC 12 Subwatersheds



The Beaver Dam Watershed features several key waterbodies, including: Beaver Dam Lake, Fox Lake, Beaver Creek, Alto Creek, and the Beaver Dam River. The City of Beaver Dam's WWTP discharges to the Beaver Dam River less than two miles from the outlet from Beaver Dam Lake. As compared to the design average WWTP flow of 5.5 mgd, the average flow of 88.1 mgd in the Beaver Dam River will continue to provide significant dilution, as shown in Table 3-3.

Table 3-3
Beaver Dam River
Low Flow Characteristics

Parameter	Flow (cfs)	Flow (mgd)
7Q10	2.6	1.7
7Q2	5.7	3.7
Average	136	88.1

Source: USGS Station #05425912, 2009-2018

In the past decade, the Beaver Dam Watershed has been sampled by several groups, as shown in Table 3-4. Its phosphorus loadings were modeled extensively during the development of the Rock River TMDL. The point of compliance for AM within the Beaver Dam Watershed is the end of Reach 34 of the Rock River TMDL, located near County Highway S in Leipsig, prior to where the Calamus Creek joins the Beaver Dam River. Limited sampling from this location suggests that the point of compliance typically experiences phosphorus concentrations between 0.1 and 0.2 mg/L.

Table 3-4 Beaver Dam Watershed Phosphorus Levels							
Location	**Phosphorus Level (mg/L)**				**Count**	**Dates**	**Ref.**
	Average	**Median**	**Min**	**Max**			
Beaver Creek at 146	0.19	-	-	-	3	2017	1
Beaver Creek at Pierce	0.12	-	-	-	3	2017	1
Beaver Creek at DG	0.23	-	-	-	3	2017	1
Beaver Creek at CTH CD	0.16	0.14	0.10	0.26	6	2014	2
Beaver Creek at 73	0.23	-	-	-	3	2017	1
Beaver Creek at CTH G	0.21	0.23	0.10	0.28	7	2019	3
Beaver Creek	0.67	0.69	0.04	0.97	13	2018	3
Mill Creek	0.15	0.16	0.04	0.23	13	2018	3
Beaver Dam Lake (Rakes Bay)	0.63	0.62	0.31	0.95	4	2018	3
Beaver Dam Lake (Breezy Point)	0.20	0.17	0.04	0.48	30	2009-2017	2
Beaver Dam Lake (South End)	0.19	-	0.07	0.20	3	2014	2
Beaver Dam Lake (North End and Deep Hole)	0.13	0.14	0.04	0.18	8	2017	1
Beaver Dam River at Cooper Street Bridge	0.21	0.17	0.08	0.90	30	2018-2019	3
Beaver Dam River at CTH S (Point of Compliance)	0.15	0.16	0.09	0.18	7	2019	3
Beaver Dam River at CTH J (Downstream of Beaver Dam Watershed)	0.31	0.29	0.18	0.42	6	2009-2010	1

References: 1. WDNR SWIMS, 2. Beaver Dam Lake Improvement Association; 3. City of Beaver Dam

Land Use

Land use and land management practices are key to understanding the water quality within the Beaver Dam Watershed. As shown in Table 3-4, the Beaver Dam Watershed is primarily agricultural, with 57% of the total acreage in cropland.

Table 3-5
Beaver Dam Watershed
Land Use

Land Use	Acres	% of Watershed
Corn	34,932	35%
Soybeans	14,760	15%
Wetlands	16,199	16%
Open Water	10,220	10%
Developed	7,579	7%
Grass/Pasture	4,901	5%
Hay	4,675	5%
Forest	4,253	4%
Other Crops	3,284	3%
Miscellaneous	362	0%
Total	**101,166**	**100%**
Total Cropland	**57,650**	**57%**

Source: USDA CropScape. Cropland includes acreage in corn, soybeans, hay, and other crops.

Corn

Corn is the dominant crop in the Beaver Dam Watershed, as shown in Figure 3-2. Corn comprises 35% of the total acres in the watershed, and more than 60% of the cropland acres. It is grown primarily for grain production, with less than 6% produced for silage. Corn is grown frequently on the same parcels, especially in the western portion of the watershed. Figure 3-3 shows that relatively higher frequencies of corn plantings occur in the Beaver Creek area and to the southwest of Fox Lake. As presented in Table 3-6, 31% of the corn acres within the Beaver Dam Watershed are managed as continuous corn, rather than in a balanced crop rotation. This high frequency of corn plantings requires measures to control for erosion and other sources of phosphorus loss to surface waters.

Figure 3-2
Beaver Dam Watershed
Land Use

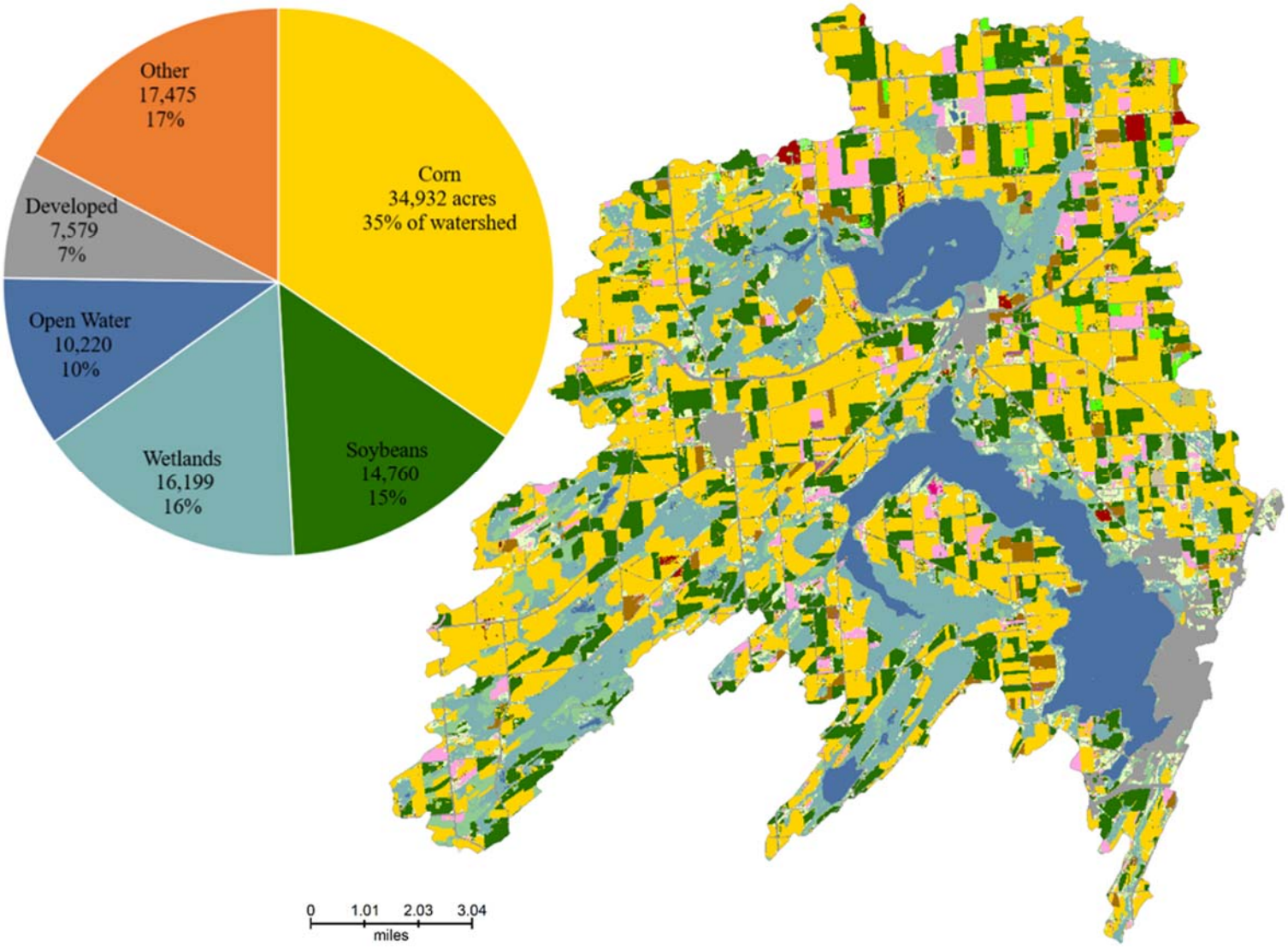


Figure 3-3
Beaver Dam Watershed
Frequency of Corn

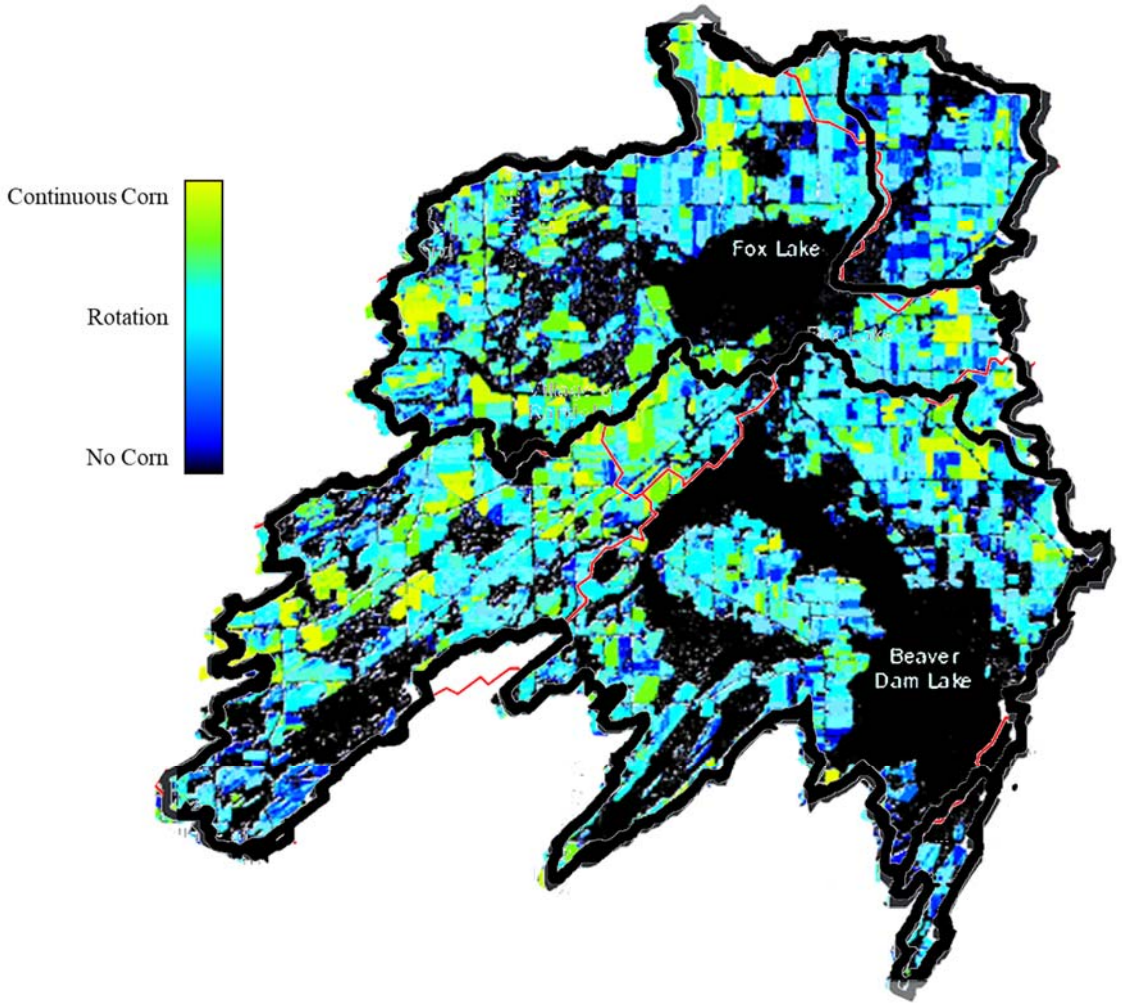


Table 3-6 Dodge County, Columbia County, and Beaver Dam Watershed Corn Practices						
Practice	**Acres**	**% of Corn Acres**	**Acres**	**% of Corn Acres**	**Acres**	**% of Corn Acres**
	Dodge County		**Columbia County**		**Beaver Dam Watershed**	
Corn for Grain	135,700	93%	123,000	95%	33,000	94%
Corn Silage	9,900	7%	5,900	5%	2,000	6%
Continuous Corn	-	-	-	-	11,000	31%
Corn in Rotation	-	-	-	-	24,000	69%

Source: USDA AgCensus for corn practices in Dodge and Columbia Counties. Total corn acres and corn frequency based on USDA CropScape. Estimated percentage of corn practices based on weighted averages for total acres in Dodge and Columbia Counties. Continuous corn is defined as frequency >80%.

Cropland Management Practices

To prevent phosphorus loss to surface waters, corn growers in the Beaver Dam Watershed employ several practices. As demonstrated in Table 3-7, practices such as cover crops, conservation easements, and no-till/reduced tillage are already in use in both Dodge and Columbia Counties.

Estimates for the Beaver Dam Watershed suggest that cover crops are planted into only 2,700 acres each year, comprising less than 5% of the total cropland and less than 8% of the total corn acres. Cover crops are especially compatible with corn production, either in continuous corn or with a rotation that does not yet include a winter cover. Cover crops support soil health, improved infiltration, reduced erosion, and can contribute to higher corn yields. Consequently, interest in cover crops by corn growers is increasing, and adoption of cover crops has great potential to reduce phosphorus loadings to surface waters.

Conservation easements are less popular, as these programs require growers to suspend their crop production in exchange for a payment. Therefore, unless there are major disruptions to agricultural markets, increased adoption of conservation easements would require substantial increases in compensation to land owners.

Most crop acres in the Beaver Dam Watershed are currently managed with either reduced tillage (49%) or no-till practices (26%). It is expected that some of the growers currently using intensive tillage (25%) may be willing to try new practices to reduce phosphorus losses, although this subset of growers typically lags behind others in the adoption of conservation management practices. In addition, growers that employ no-till may not see significant reductions in phosphorus losses if they add cover crops. Based on these factors, it is anticipated that improved tillage practices may offer a secondary option for reduced phosphorus loadings to surface waters.

Table 3-7
Dodge County, Columbia County, and Beaver Dam Watershed Cropland Management Practices

Practice	Dodge County		Columbia County		Beaver Dam Watershed (Est.)	
	Acres	% of Cropland	Acres	% of Cropland	Acres	% of Cropland
Cover Crop	15,797	5%	7,142	3%	2,700	5%
Conservation Easement	9,288	3%	2,977	1%	1,500	3%
No-Till	67,967	25%	63,977	32%	15,200	26%
Reduced Till	136,459	49%	95,034	47%	28,100	49%
Intensive Till	71,215	26%	42,004	21%	14,200	25%
Total Cropland	307,839	100%	230,768	100%	57,650	100%

Source: USDA AgCensus for cropland management practices in Dodge and Columbia Counties. Total cropland for counties and Beaver Dam Watershed based on USDA CropScape. Estimated percentage of cropland practices based on weighted averages for total acres in Dodge and Columbia Counties.

Other factors, such as soil and land characteristics, are included in the Appendix. A windshield survey and a detailed inventories were conducted for the Beaver Dam Lake Shoreline as well as for Beaver Creek. A broader windshield survey for other areas for action is included in the schedule.

CRITICAL SOURCE AREAS

Critical Source Areas (CSAs) should be identified to efficiently meet the goals of AM. These CSAs are marked by areas of high phosphorus losses as well as high potential for phosphorus transport to the surface water. Over several decades, leadership by the Beaver Dam Lake Improvement Association has demarcated specific areas of improvement within the Beaver Dam Watershed. CSA identification will continue as part of the early phases of the AM process, including further engagement with the Land and Water Conservation Departments (LWCD) of Dodge and Columbia Counties[1], and the Dodge County Farmers For Healthy Soil Healthy Water (FHSHW)[2]. As the focus of the AM plan shifts and is refined, CSA identification and the watershed inventory will continue to be updated as needed. However, the initial focus of the watershed inventory and CSAs were Beaver Creek and Beaver Dam Lake, as described below.

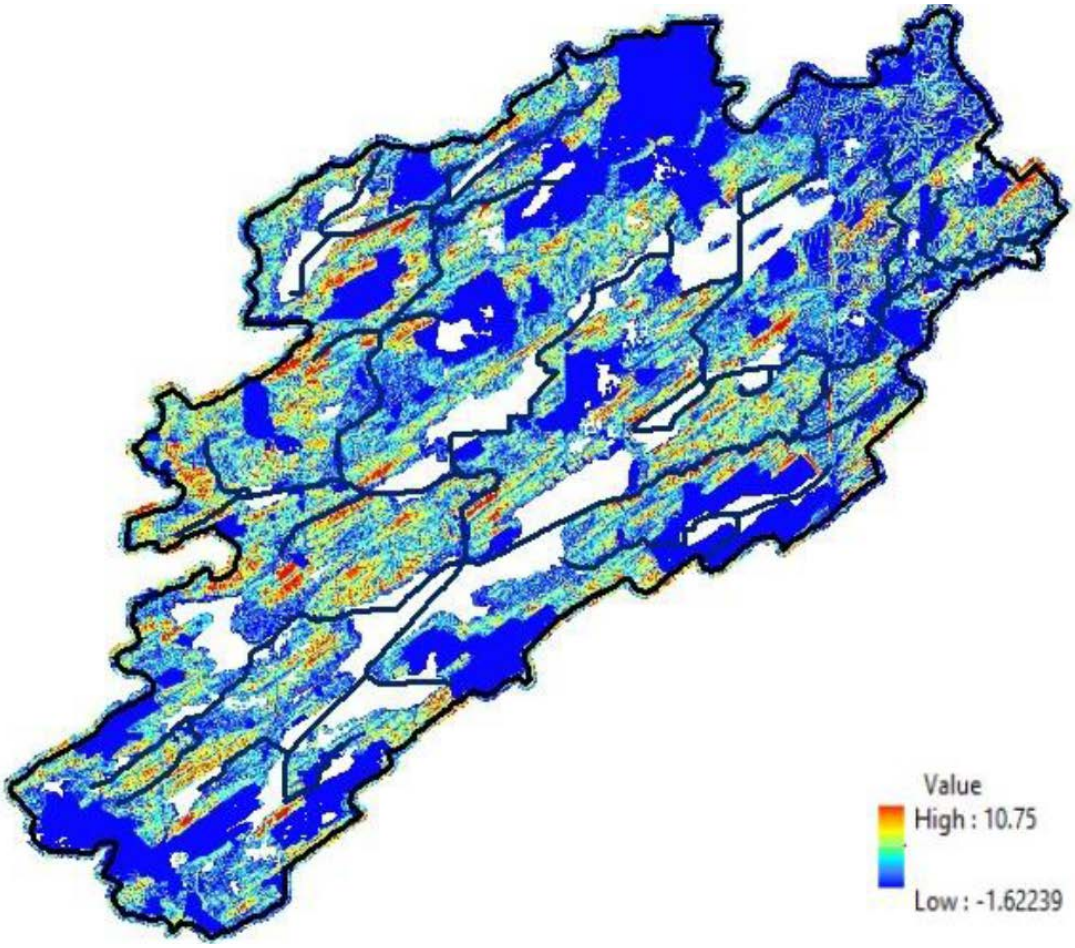
Beaver Creek Subwatershed

Beaver Creek is a major source of phosphorus loadings and the largest tributary to Beaver Dam Lake. Beaver Creek is on the impaired waters list for TP and degraded biological community impact. Similar to the Beaver Dam Watershed, land use is dominated by agriculture (>70%). A detailed study, sponsored by the Beaver Dam Lake Improvement Association, was conducted by the University of Wisconsin Watershed Resource management to assess the watershed make recommendations to improve water quality within Beaver Creek and the Beaver Dam Watershed.

To address phosphorus loadings to the surface waters, Critical Source Areas (CSAs) were identified. CSA identification relied on both a windshield survey as well as determining the Erosion Vulnerability Index (EVI) using the Erosion Vulnerability Assessment of Agricultural Lands (EVAAL) modeling tool. By mapping the EVI within the Beaver Creek Subwatershed in Figure 3-4, red and orange areas identified several ‘hot spots’.

[1] Dodge County LWCD identified reduced tillage practices that are currently being considered at 200 acres of Zeman Farms on County Road W. In addition, three sites with shoreline erosion estimated at approximately 0.1 lb P/lf totaled to approximately 200 lbs P.
[2] Dodge County FHSHW is in the process of identifying specific CSAs.

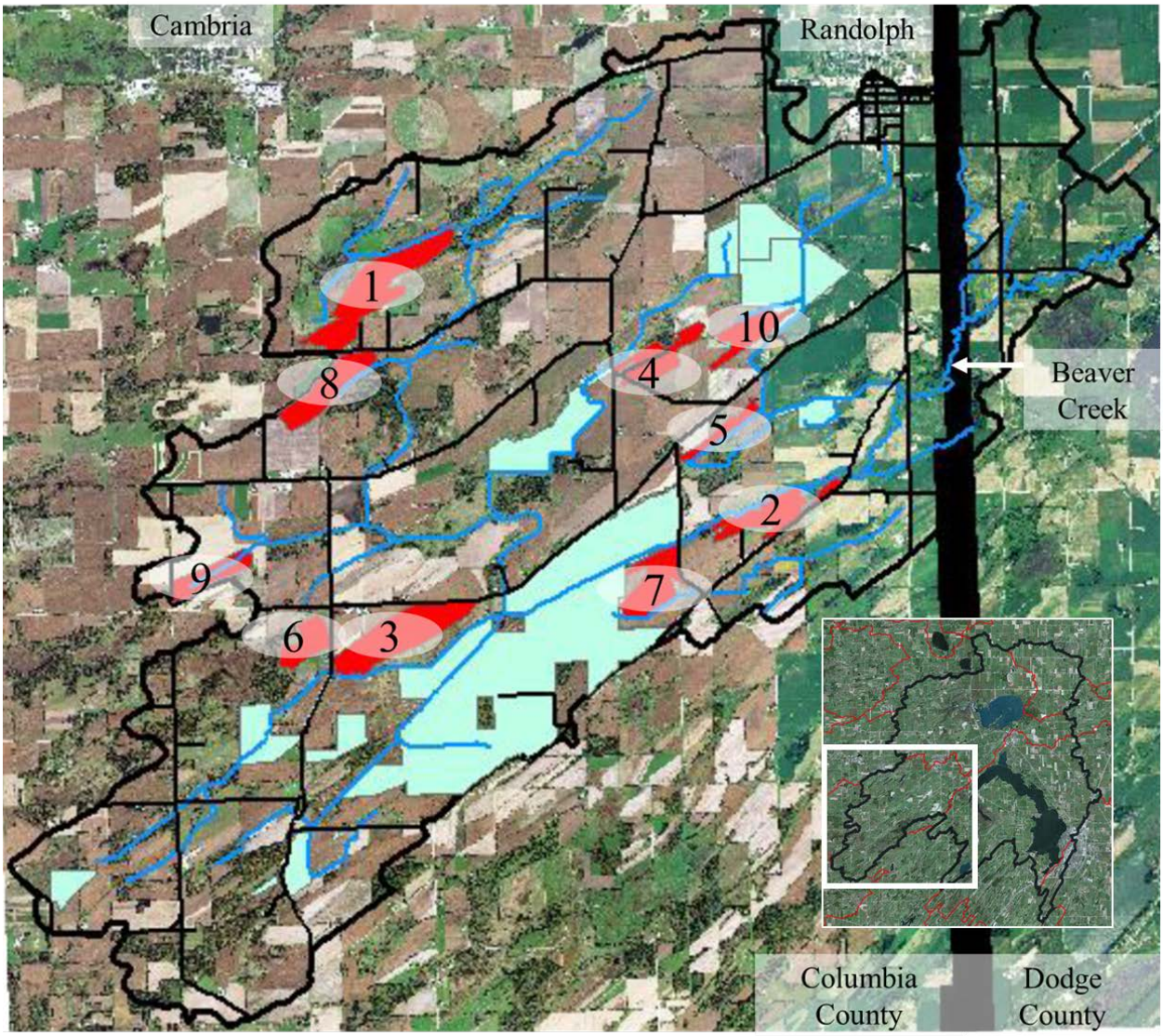
Figure 3-4
Beaver Creek Subwatershed
Erosion Vulnerability Index (EVI)



Twenty-eight parcels with high EVIs were identified, as shown in the Appendix. The total acreage was approximately 1,300 acres, with an average EVI of 7.3. Table 3-8 lists the Top 10 CSAs, while Figure 3-5 depicts them graphically. These were determined by ranking the 28 sites by size, EVI, and proximity to water. Proximity of water served as a proxy for likelihood of phosphorus transport into the surface water. Each factor was ranked, and the average rank was calculated to determine the overall rank. In total, the Top 10 CSAs represent approximately 770 acres with an average EVI of 8.1 and a proximity to water of 76 meters.

Table 3-8 Beaver Creek Subwatershed Top 10 Critical Source Areas				
Overall Rank	**Site**	**Acres**	**Erosion Vulnerability Index (EVI)**	**Proximity to Water (m)**
1	6.5	77	8.5	0
2	24	79	8.0	10
3	15	193	9.0	86
4	19	72	8.4	100
5	22	55	7.5	46
6	14	59	9.4	190
7	Field 2	57	7.9	84
8	8	79	6.6	76
9	11	50	7.5	68
10	20	47	8.1	95
Average	**-**	**77**	**8.1**	**76**
Total	**-**	**769**	**-**	**-**

Figure 3-5
Beaver Creek Subwatershed
Top 10 Critical Source Areas



Beaver Dam Lake

Beaver Dam Lake spans roughly 6,800 acres, or nearly 7% of the Beaver Dam Watershed. The lake suffers from impaired water quality, with both external and internal sources of phosphorus loadings. External phosphorus loadings were recently estimated to comprise 55% of the loading, with almost 93% of this external loading derived from the Beaver Creek Subwatershed. Overall, recent evaluations demonstrated that cropland contributes the majority of external phosphorus loading[3]. Notably, previous estimates concluded that only 10% of the lake loading was derived from external sources, with up to 90% derived from internal recycling. With a more balanced estimate between external (55%) and internal (45%) loading, a balanced approach to reductions is recommended for an effective AM plan.

Two types of CSAs were identified for Beaver Dam Lake: carp management and shoreline erosion protection. First, improved carp management is recommended throughout the lake. Sediment is resuspended by both wind and carp, and resuspended sediment decreases water clarity and increases lake phosphorus levels. Consequently, reducing the carp levels should be an important component of an AM plan.

The carp concentration in Beaver Dam Lake is estimated to be 330 pounds per acre[3]. Carp levels above 268 pounds per acre cause excessive vegetative and lake bed damage, based on guidance from the US Fish and Wildlife Service. Due to their destructive foraging methods, carp remove beneficial plants and disturb the beds of lakes. Carp excrement then adds phosphorus at a rate of 0.011 pounds for each pound of carp[4].

To efficiently reduce carp populations, both breeding habitat control strategies and consistent commercial capture[5] are necessary. Breeding can be deterred by degrading or installing barriers to three large shallow bays, especially for the 450 acre Rakes Bay near Site 14 in Figure 3-6.

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[3] Beaver Dam Lake Improvement Association Reports: Bradford et al. 2017, Butterfiedl et al. 2015, Onterra, 2014.
[4] LaMarra, VA Jr. 1975. Digestive activities of carp as a major contributor to the nutrient loading of lakes.*Verh. Int. Verein. Limnol.*19:2461–68
[5] Unfortunately, commercial capture rates have been inconsistent, and the previous commercial fishing bid was not renewed by the WDNR in 2019.

Preliminary drawings and cost estimates are in development. In addition, two backwater wetland areas near McKinley Beach Boulevard support considerable breeding. These areas are shown as Site 4 in Figure 3-6. Adding barriers to the culverts that provide access to these areas shows promise, and further details are currently being investigated.

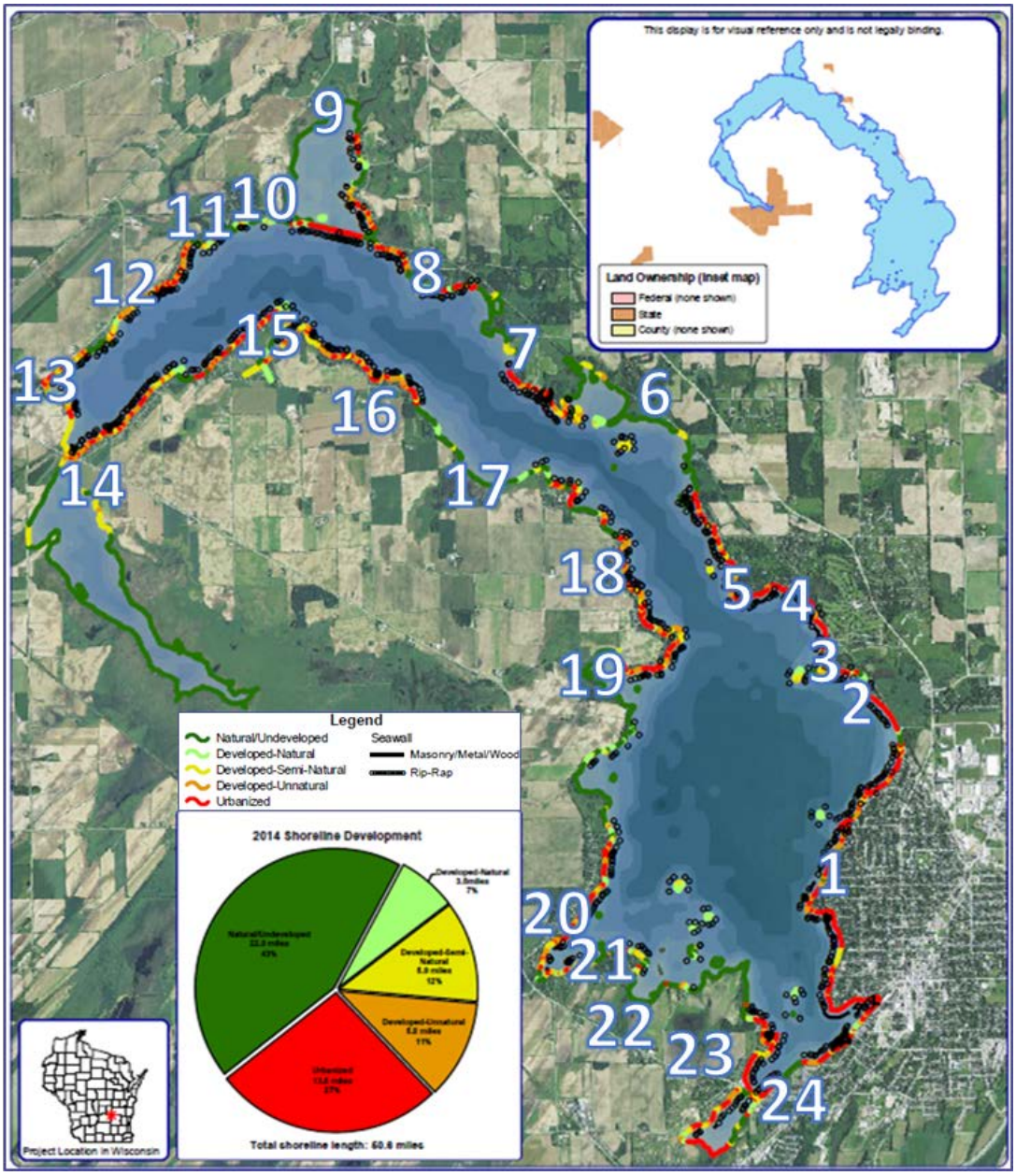
Second, extensive shoreline erosion has been identified by the Beaver Dam Lake Improvement Association and the Dodge County Land and Water Conservation Department. A full shoreline inventory that was conducted in 2018, as presented in Figure 3-6. A table is included in the Appendix, and further prioritization efforts will continue through the AM plan.

One area for focus is the shoreline near Rakes Bay, south of Beaver Creek and to the northwest of Site 14 in Figure 3-6, where land owned by the WDNR has suffered extensive shoreline erosion. In addition to establishing native plantings or riprap for shoreline protection, an area including approximately 200 acres of marsh is currently being evaluated for improvements. Specifically, the WDNR is evaluating the effects of reintroducing oxbows and other features to minimize the detrimental effects of pulse flows under storm conditions. The goal of these efforts is to restore the buffering capacity of the marsh. Drawings and cost estimates are being developed.

Another area for focus includes shoreline near Derge Park, near Site 18 in Figure 3-6. An unnamed creek outflow currently conveys phosphorus-rich runoff into the lake from approximately 300 acres. It was determined that a sediment basin may be able to slow the water outflow velocity and promote nutrient settling. The Dodge County Parks Master Plan includes plans for the future addition of a sediment basin. Construction drawings and cost estimates were obtained, which will accelerate implementation.

By focusing on CSAs within and in proximity to Beaver Dam Lake, the AM plan allocate resources to reduce phosphorus loadings in the Beaver Dam Watershed.

Figure 3-6
Beaver Dam Lake
Shoreline Inventory



Source: Beaver Dam Lake Improvement Association, 2014 Report (Onterra), 2018 Shoreline Inventory

SECTION 4
LOAD REDUCTION PLAN

To meet the Water Quality Criterion, phosphorus loadings to the Beaver Dam Watershed will need to be reduced by approximately 7,400 pounds per year. The City of Beaver Dam plans to meet this goal by focusing on three categories of management practices: 1) Wastewater Treatment Plant Improvements; 2) Agricultural and Land Management; and 3) Lake and Shoreline Management. Other practices will be utilized, as necessary. Resources will be allocated to each management approach based on the lowest cost of phosphorus reductions, along with consideration for the anticipated extent of possible reductions.

MANAGEMENT PRACTICES

The primary phosphorus load reduction practices will be categorized as follows: 1) Wastewater Treatment Plant Improvements; 2) Agricultural and Land Management; and 3) Lake and Shoreline Management. Other practices will be used as necessary, such those used to meet TMDL-required MS4 reductions.

Wastewater Treatment Plant Improvements

Under current practices, the City of Beaver Dam Wastewater Treatment Plant (WWTP) adds ferric chloride for chemical phosphorus removal. The current average effluent phosphorus level is approximately 0.8 mg/L. Based on periods of higher dosing, it is expected that the City can achieve an effluent phosphorus level of 0.4 mg/L. This level should be sufficient to meet the initial and eventual AM effluent phosphorus limits of 0.6 and 0.5 mg/L, respectively. To achieve this improved level, the required chemical dosing is expected to double. The current annual ferric chloride addition rate is approximately 120,000 gallons per year with a cost of approximately $90,000. Therefore, by the end of the second permit of the AM plan, the WWTP is expected to reduce annual phosphorus loadings by 5,800 pounds, with an additional annual cost of approximately $90,000.

Agricultural and Land Management

In addition to point source improvements, several types of agricultural and land management practices may be pursued to reduce non-point source loadings and soil erosion. Potential management practices are numerous, such as:

- Cover crops
- Improved tillage
- Conservation easements
- Nutrient management plans
- Riparian buffers
- Grassed waterways
- Retention ponds
- Barnyard improvements
- Wetland restoration
- Streambank stabilization.

As detailed in Section 3, an estimated 55% of phosphorus loadings to Beaver Dam Lake are estimated to be derived from external sources, primarily agricultural runoff. Therefore, it is expected that a preliminary target of at least 55% of non-point source loading reductions will be derived from agricultural and land management practices.

The adoption of cover crops within corn production systems is expected to be the primary focus for agricultural improvements. A secondary focus is reduced tillage practices, especially for intensively tilled parcels. These are anticipated to occur in the identified CSAs of the Beaver Creek Subwatershed as well as elsewhere within the Beaver Dam Watershed. An annual reduction of 700 pounds is anticipated by the conclusion of the Adaptive Management Plan schedule. This level is achievable within the Top 10 CSAs identified (770 pounds), and an extra 600 pounds is achievable within the remaining CSAs in the Beaver Creek Subwatershed. Outreach to growers is expected to be based on direct contact via farmer-to-farmer networks. Groups such as the Dodge County FHSHW and the County LWCDs are anticipated to be critical to these outreach efforts.

SnapPlus modeling was conducted on four representative farms within the Beaver Dam Watershed, as shown in Figure 4-1. This modeling was conducted to determine the anticipated loading reductions for different practices. The adoption of cover crops would reduce annual phosphorus losses by approximately 1 pound per acre for the average tilled cropland in the Beaver Dam Watershed. By comparison, adopting no-till practices was expected to reduce annual phosphorus losses by approximately 2 pounds per acre for the average tilled cropland in the Beaver Dam Watershed. Details are included in the Appendix. To meet the annual phosphorus reduction target of 700 pounds, 700 acres of cover crops would need to be planted, or less than 350 acres would need to be converted to no-till practices. With more than 30,000 acres of corn production without cover crops, there are abundant opportunities to incorporate conservation practices on fewer than 1,000 acres. Based on an estimated $45/acre[6], these practices would result in annual costs of approximately $31,500 by the end of the second permit term.

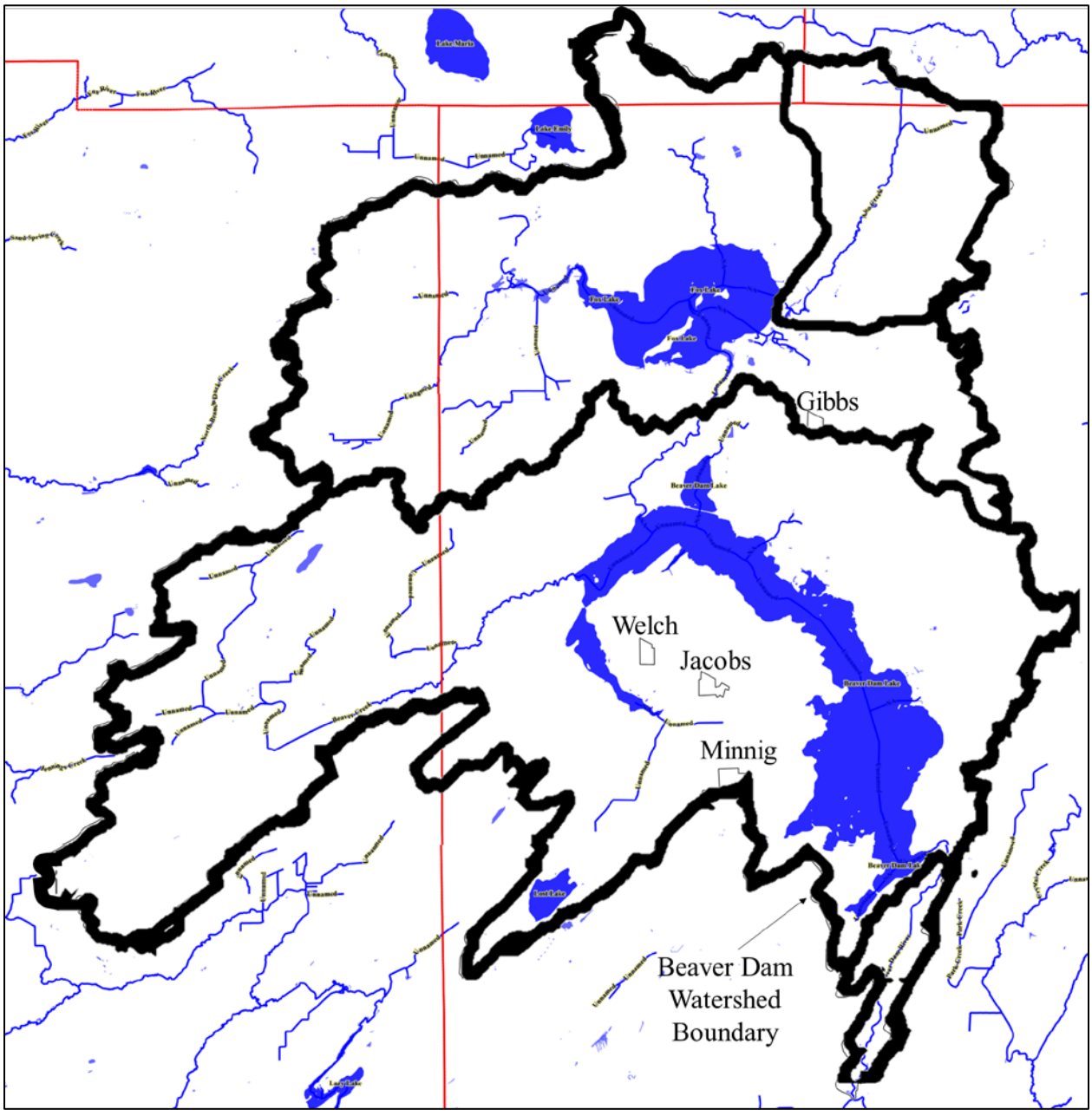
Lake and Shoreline Management

Beaver Dam Lake presents several additional opportunities for phosphorus reductions, such as carp management and shoreline stabilization efforts detailed in Section 3. Based on the lake's size of 6,800 acres, 330 pounds of carp per acre, and a specific annual phosphorus loading of 0.011 pounds per pound of carp, it is estimated that carp contribute more than 24,000 pounds per year. By reducing the carp density to the US Fish and Wildlife maximum level of 268 pounds per acre, the anticipated annual phosphorus reduction would total at least 4,600 pounds.

Shoreline stabilization efforts were also defined by the Beaver Dam Lake Improvement Association in Section 3, with an additional 200 pounds identified by the Dodge County LWCD. The costs for these reductions are less defined than other options, so it was assumed that these reductions could be accomplished for the equivalent nonpoint source reduction cost of $45 per pound phosphorus. With a target of less than 600 pounds by the end of the second permit term, the total annual cost is anticipated to be less than $27,000.

[6] Based on Oconomowoc Watershed Protection Program, Tom Steinbach, personal communication.

Figure 4-1
Beaver Dam Watershed
Representative Farms for SnapPlus Modeling



LOAD REDUCTION SCHEDULE

The load reduction schedule is presented in Table 4-1. In addition to the actions detailed here, efforts will be made starting in the first permit term to monitor water quality, conduct additional windshield surveys, and register new practices for potential use in Water Quality Trading (WQT).

Table 4-1
Load Reduction Schedule

Load Reductions	City WWTP Effluent		City MS4	Ag/ Land	Lake/ Shoreline	Total	Required
	(mg/L)	(lb/yr)	(lb/yr)	(lb/yr)	(lb/yr)	(lb/yr)	(lb/yr)
2019							
Incremental	0.7	1831				**1831**	
Cumulative		1831				**1831**	**1831**
Annual Cost		$22,500				**$22,500**	
2024 – End of Permit Term 1							
Incremental	0.55	1963		105	150	**2218**	
Cumulative		3795		105	150	**4050**	**4050**
Annual Cost		$56,250		$4,725	$6,750	**$67,700**	
2029 – End of Permit Term 2							
Incremental	0.4	1963	374	595	426	**3358**	
Cumulative		5758	374	700	576	**7408**	**7408**
Annual Cost		$90,000	-	$31,500	$25,920	**$147,400**	

1. City WWTP Effluent: 0.8 mg/L Jan - Jun 2019; 0.6 mg/L Jul - Dec 2019
2. Annual costs compared to 2018 Budget
3. City MS4 required by TMDL to decrease by 374 pounds per year

Minimum First-Term Offset

The minimum first term offset was determined to be approximately 4,050 lb/yr. This was calculated based on two factors: the required total load reduction to the Beaver Dam Watershed (7,408 lb/yr) and the City's TMDL-reported portion (10,994 lb/yr) of the current total watershed loading (20,106 lb/yr). As described in a previous section, the baseline loadings in the Beaver Dam Watershed could be calculated by dividing the values in Appendix J (Total Phosphorus Allocations) by the values in Appendix H (Required Percent Reduction of TP from Annual Baseline Load) of the Rock River TMDL. A summary of these values is included in Table A-2 of Appendix A.

SECTION 5
PROJECT METRICS

To ensure success, two key metrics will be evaluated annually: water quality and financial viability. Decisions will be made prior to the start of each new permit term. It is anticipated that other partners may provide additional metrics.

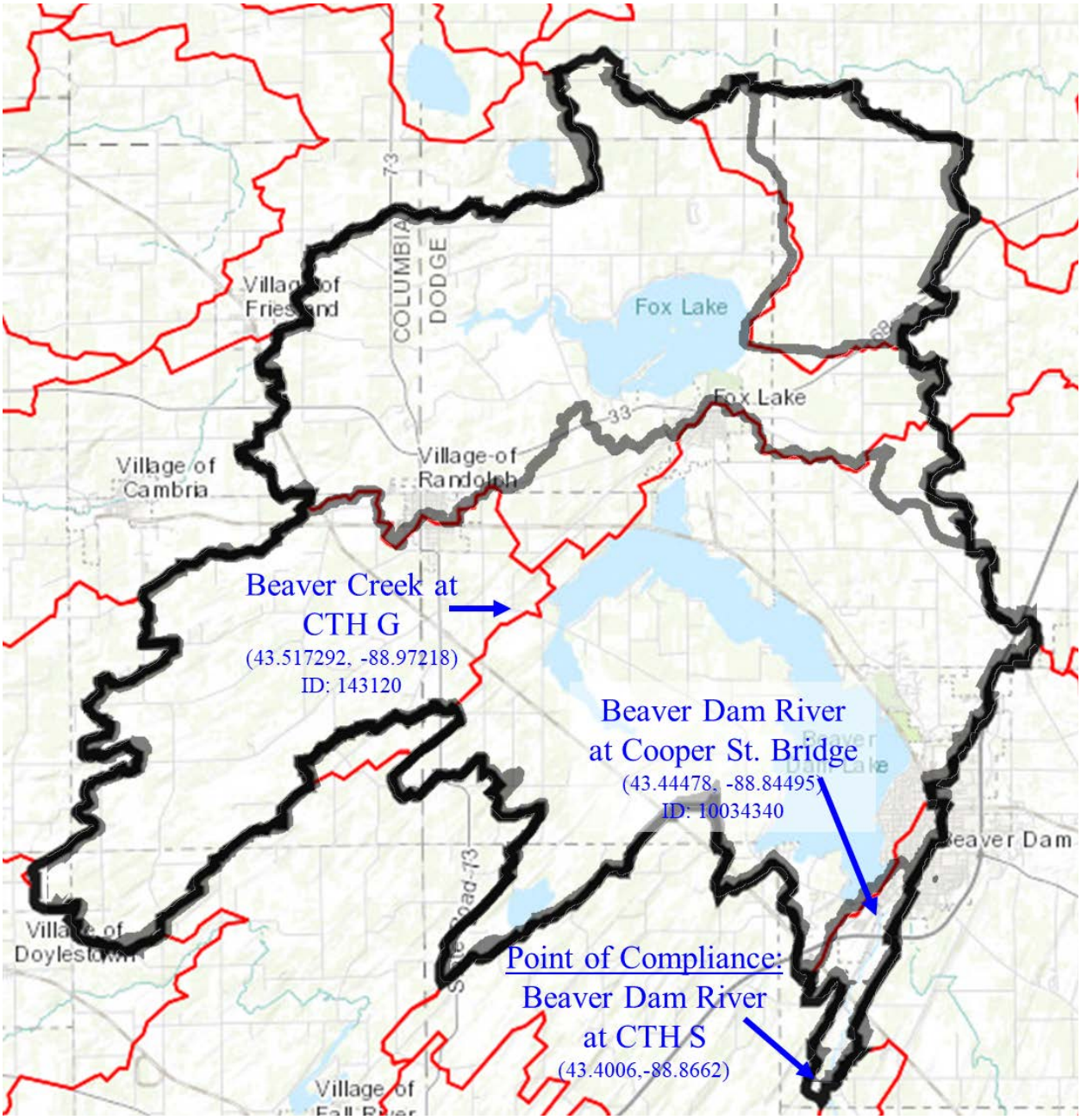
MEASURING SUCCESS

Adaptive management is a flexible and creative approach for communities and watersheds to achieve specific Water Quality Criteria. Therefore, monitoring of water quality is critical. As detailed in Section 3, monitoring will focus on the Point of Compliance at the bottom of the Rock River TMDL Reach 34. The specific sampling location is proposed to be where the Beaver Dam River crosses County Highway S in Leipsig, as shown in Figure 5-1. All sampling locations will be in the open river beyond interference from bridges or downstream waterways. Sampling will be conducted in the growing season only (May through October), with at least one sample per month. The City will conduct sampling, based on the protocols included in the Appendix.

Reach 34 comprises less than 2,000 acres, which is less than 2% of the overall Beaver Dam Watershed. Consequently, most nonpoint source reductions are expected to occur upstream of Reach 34. An additional sampling location near the beginning of Reach 34 would be useful to measure upstream reductions. Sampling presently occurs at the Cooper Street Bridge in Beaver Dam, and continued sampling is recommended.

Several partners prioritized the Beaver Creek Subwatershed for new practices and improvements. It is anticipated that several practices will be adopted in this subwatershed, and sufficient measuring should accompany any new practices. As shown in Figure 5-1, a prospective sampling location at the end of Beaver Creek was identified, and sample frequency will likely increase beyond current sampling at all three prospective sites.

Figure 5-1
Beaver Dam Watershed
Prospective Water Quality Sampling Locations



With the adoption of new practices, several steps will be taken. First, proposed new practices will be modeled via SnapPlus or other applicable programs, both under baseline and new conditions. Second, new practices that will be funded by the City will be registered for potential use in Water Quality Trading (WQT). Next, the City will rely on county LWCD staff and/or members of farmer-to-farmer networks (e.g. Dodge County FHSHW) to conduct monitoring of installed practices.

Practice monitoring will be conducted via site visits, windshield surveys, and geographic information system (GIS) data. Monitoring will include a 1) determination of practice status, 2) notification of landowner of corrective action (if necessary), 3) implementation of corrective action (if necessary), 4) documentation of corrective action, and 5) updating of database and modeling (if necessary). Monitoring will occur at least once per permit term, and the City will ensure that a comprehensive database is maintained.

Annual reporting to the WDNR will keep the Adaptive Management Plan on course. Annual reporting will include several metrics, including the following: stream and river monitoring, numbers of stakeholders contacted, practices and payments planned and completed, implemented practice monitoring, and pollutant load reductions achieved.

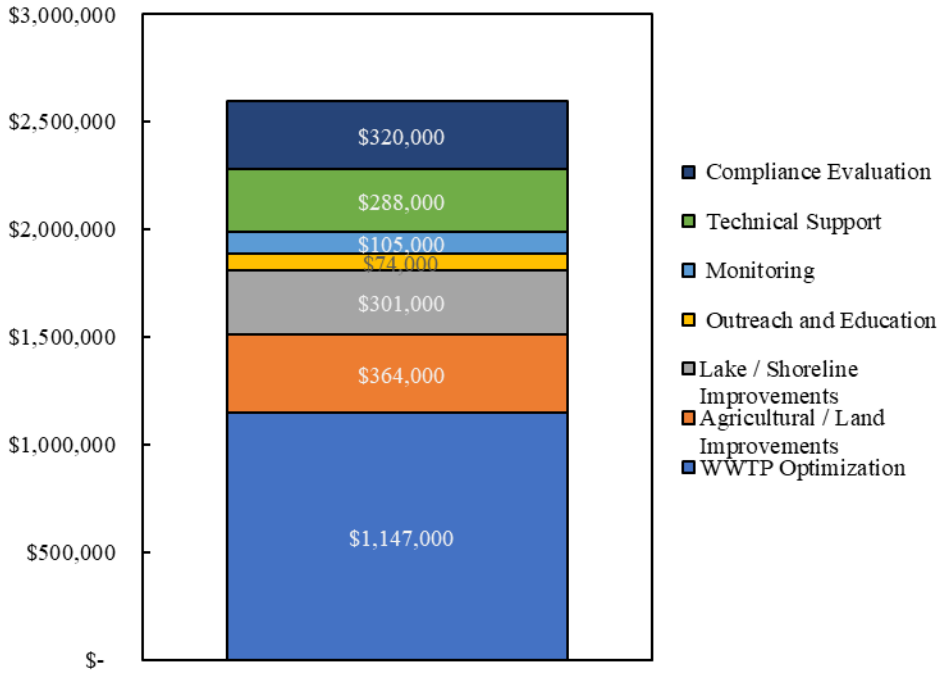
FINANCIAL VIABILITY

Sustained environmental success requires financial viability. Based on the values presented in Figure 5-2, the total present worth of Adaptive Management was determined to be the most cost effective of all alternatives evaluated. Additional details are included in the Appendix.

As the City of Beaver Dam begins working with partners to reduce loadings, the anticipated compliance costs of Adaptive Management will be continually updated and evaluated. In addition, annual evaluations required by the compliance schedule will keep the City cognizant of its resource allocation. If Adaptive Management no longer remains the most cost-effective compliance option, the City may exercise its option to select another compliance alternative. This change would likely occur upon permit reissuance, currently expected every five years.

Adaptive Management is anticipated to be the lowest cost compliance option. With great partnerships, smart evaluations, and an open approach, the City of Beaver Dam is eager to do its part in meeting the goals established in this Adaptive Management Plan. Working together, the Beaver Dam Watershed is poised for great progress and improvements for years to come.

Figure 5-2
Adaptive Management Plan
Total Present Worth



APPENDIX

APPENDIX A:
ADAPTIVE MANAGEMENT

Dodge County
Land and Water Conservation Department
127 East Oak Street · Juneau, WI 53039-1329
PHONE: (920) 386-3660
EMAIL: landcons@co.dodge.wi.us

Mr. Matthew Claucherty
Department of Natural Resources
PO Box 7921
Madison, WI 53707

Dear Mr. Claucherty:

My name is John Bohonek, and I serve as County Conservationist for the Dodge County Land and Water Conservation Department. A key mission of the Dodge County Land and Water Conservation Department is to work with farmers and landowners to improve water quality in Dodge County.

Earlier this year, we learned about the Adaptive Management Plan proposed by the City of Beaver Dam. This proposal will decrease phosphorus loadings in the Beaver Dam Watershed and improve water quality. The goals and approaches proposed are aligned with our own mission, and we are therefore very excited to support the proposed efforts.

If you have any questions, please feel free to contact me. Otherwise, thank you for evaluating this important proposal to improve our county's water quality.

Sincerely,

John Bohonek
County Conservationist
Dodge County Land Water Conservation Department
127 East Oak Street, Juneau, WI. 53039
920-386-3662
jbohonek@co.dodge.wi.us

COLUMBIA COUNTY
Land & Water Conservation

608-742-9670
FAX: 608-742-9840
E-MAIL: land.conservation@co.columbia.wi.us
WEBSITE: www.co.columbia.wi.us

112 East Edgewater Street
Portage, WI 53901

7/12/2019

Mr. Matthew Claucherty
Department of Natural Resources
PO Box 7921
Madison, WI 53707

Dear Mr. Claucherty:

My name is Kurt R. Calkins, and I serve as Director of the Columbia County Land & Water Conservation Department. A key mission of the Columbia County Land & Water Conservation Department is to work with farmers and landowners to improve water quality in Columbia County and surrounding watersheds.

Earlier this year, we learned about the Adaptive Management Plan proposed by the City of Beaver Dam. This proposal will decrease phosphorus loadings in the Beaver Dam Watershed and improve water quality. The goals and approaches proposed are aligned with our own mission, and we are therefore very excited to support the proposed efforts and work as a partner.

If you have any questions, please feel free to contact me. Otherwise, thank you for evaluating this important proposal to improve our county's water quality.

Sincerely,

Kurt R. Calkins, Director
Columbia County
Land & Water Conservation Department
112 East Edgewater Street
Portage, WI 53901
(608) 742 9670
kurt.calkins@co.columbia.wi.us

William Foley
W9631 Rose Circle
Beaver Dam, Wi 53916

June 30, 2019

Mr. Matthew Claucherty
Department of Natural Resources
PO Box 7921
Madison, WI 53707

Dear Mr. Claucherty:

My name is William Foley, and I serve as Vice President for the BDLIA, as well as, a member of the Dodge County Land & Water Conservation Committee. An essential mission of the Beaver Dam Lake Improvement Association is to work with farmers and landowners to improve water quality in Dodge and/or Columbia County. The recent presentation regarding Adaptive Management Practices by Andrew Craig provided the core for a Program which offers great potential for our Community.

Earlier this year, we learned about the Adaptive Management Plan proposed by the City of Beaver Dam. This proposal will decrease phosphorus loadings in the Beaver Dam Watershed and improve water quality. The goals and approaches proposed are aligned with our own mission, and we are therefore very excited to support the proposed efforts.

If you have any questions, please feel free to contact me. Otherwise, thank you for evaluating this important proposal to improve our county's water quality.

Sincerely,

William Foley
Vice President
Beaver Dam Lake Improvement Association
W9631 Rose Circles, Beaver Dam Wi 53916
Phone: 920 356 9123
Email : blfoley13@charter.net

For: July 19, 2019

On behalf of the Dodge County Farmers for Healthy Soil- Healthy Water Group

Letter of Support

To whom it may concern,

The Dodge County Farmers for Healthy Soil – Healthy Water would like to show our support for the city of Beaver Dam to work with the DNR to implement an Adaptive Management Program to improve the quality of water within the Beaver Dam watershed.

The Dodge County Farmers group mission is to improve our community's soil and water through conservation practices and education and find that an adaptive management plan looking at all sources of impairment to the greater beaver dam watershed, point and non-point, is agreeable to our goals.

Sincerely,

The Dodge County Farmers for Healthy Soil-Healthy Water Group

Tony Peirick

Tony Peirick

Chair

Dodge County Farmers

(920) 390-0583

Martin Weiss

Martin R. Weiss

Chair

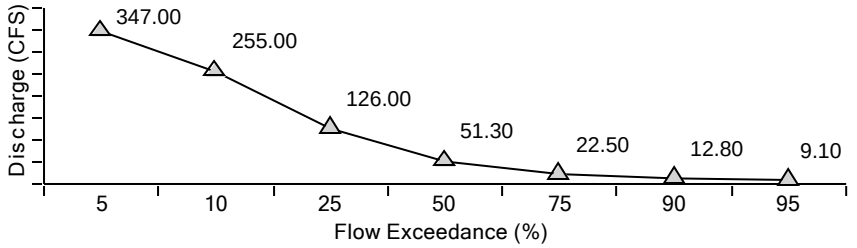
Dodge County Farmers

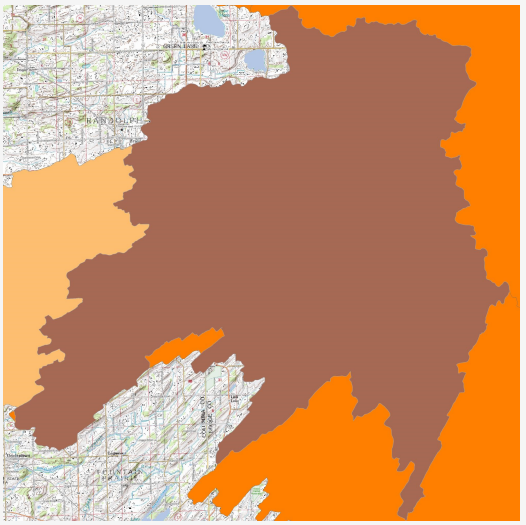
(920) 296-4764

PRESTO-Lite Watershed Delineation Report

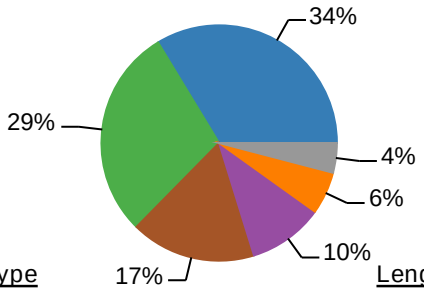
Reach ID: 200039879
Watershed Name: Village of Reeseville-Beaver Dam River
Waterbody Name: Beaver Dam River
HUC08: Upper Rock
Watershed Area: 157.99 mi²
Average Annual Precipitation: 32.48in

Stream Flow



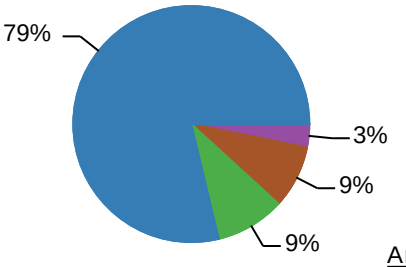


Tributary Stream Type



Type	Length
Macroinvertebrates	77765 ft
Cold Headwater	66809 ft
Cool-Cold Headwater	39610 ft
Warm Headwater	23832 ft
Warm Mainstem	13485 ft
Coldwater	9356 ft
Cool-Cold Mainstem	0 ft
Cold Mainstem	0 ft
Large River	0 ft

Landcover



Type	Area
Agriculture	111.54 mi²
Wetland	13.43 mi²
Urban	12.18 mi²
Forest	4.52 mi²
Barren	0.21 mi²
Grassland	0.14 mi²

PRESTO Phosphorus Load Estimate

Avg. Annual Nonpoint Phosphorous Load (80% Confidence Interval)	53,112 (17,031 - 165,627) lbs
Number of Facilities (Individual Facility Information below)	2
Avg. Annual Point-source Phosphorous Load (2010 - 2012 total of all facilities)	9,924lbs
Most Likely Point : Nonpoint Phosphorous Ratio	16% : 84%
Low Estimate Point : Nonpoint Phosphorous Ratio (Adaptive Management)	6% : 94%

Adaptive Management Results

Facilities Discharging to the Village of Reeseville-Beaver Dam River Watershed:

Facility Name	Permit #	Outfall #	Waste Type	Receiving Water	Avg. Phosphorus Load (lbs.) (2010 - 2012)
BEAVER DAM WASTEWATER TREATMENT FACILITY	0023345	001	Municipal	Beaver Dam River	7860
RANDOLPH WASTEWATER TREATMENT FACILITY	0031160	001	Municipal	Unnamed	2064

Table A-1
Adaptive Management Overall Costs

Item	Annual Cost				TPW Factor	Total Present Worth	Notes			
	Permit 1	Permit 2	Long-Term	Average	14.05	$	Value	Unit	Rate	Unit
WWTP Optimization										
Additional Ferric Chloride	$ 56,250	$ 90,000	$ 90,000	$ 81,600	14.05	$ 1,147,000	$21	$/lb TP		
Subtotal	**$ 56,250**	**$ 90,000**	**$ 90,000**	**$ 81,600**	**14.05**	**$ 1,147,000**				
Agricultural / Land Improvements										
Implement Practices	$ 4,725	$ 15,750	$ 31,500	$ 20,900	14.05	$ 294,000	$45	$/lb TP		
Labor - Staff	$ 2,000	$ 2,000	$ 2,000	$ 2,000	14.05	$ 28,000	20	h / year	$ 100	$/hr
Labor - Partners	$ 3,000	$ 3,000	$ 3,000	$ 3,000	14.05	$ 42,000	20	h / year	$ 150	$/hr
Subtotal	**$ 9,725**	**$ 20,750**	**$ 36,500**	**$ 25,900**		**$ 364,000**				
Lake / Shoreline Improvements										
Implement Practices	$ 6,750	$ 12,960	$ 25,920	$ 17,900	14.05	$ 252,000	$ 45	$/lb TP		
Labor - Staff	$ 2,000	$ 2,000	$ 2,000	$ 2,000	14.05	$ 28,000	20	h / year	$ 100	$/hr
Labor - Partners	$ 1,500	$ 1,500	$ 1,500	$ 1,500	14.05	$ 21,000	10	h / year	$ 150	$/hr
Subtotal	**$ 10,250**	**$ 16,460**	**$ 29,420**	**$ 21,400**		**$ 301,000**				
Outreach and Education										
Labor - Staff	$ 500	$ 2,000	$ 2,000	$ 1,600	14.05	$ 22,000	20	h / year	$ 100	$/hr
Labor - Partners	$ 750	$ 3,000	$ 3,000	$ 2,400	14.05	$ 34,000	20	h / year	$ 150	$/hr
Materials	$ 2,000	$ 1,000	$ 1,000	$ 1,300	14.05	$ 18,000	1,000	$/year	$ 2,000	Initial Cost
Subtotal	**$ 3,250**	**$ 6,000**	**$ 6,000**	**$ 5,300**		**$ 74,000**				
Monitoring										
Labor - Staff	$ 2,000	$ 8,000	$ 8,000	$ 6,500	14.05	$ 91,000	80	h/year	$ 100	$/hr
Materials	$ 1,000	$ 1,000	$ 1,000	$ 1,000	14.05	$ 14,000	4,000	$/year		
Subtotal	**$ 3,000**	**$ 9,000**	**$ 9,000**	**$ 7,500**		**$ 105,000**				
Technical Support										
Labor - Partners	$ 6,000	$ 24,000	$ 24,000	$ 19,500	14.05	$ 274,000	160	h / year	$ 150	$/hr
Modeling Software	$ 1,000	$ 1,000	$ 1,000	$ 1,000	14.05	$ 14,000	1,000	$/year		
Subtotal	**$ 7,000**	**$ 25,000**	**$ 25,000**	**$ 20,500**		**$ 288,000**				
Compliance Evaluation										
Labor - Partners	$ 6,000	$ 24,000	$ 24,000	$ 19,500	14.05	$ 274,000	160	h / year	$ 150	$/hr
Labor - Staff	$ 1,000	$ 4,000	$ 4,000	$ 3,300	14.05	$ 46,000	40	h / year	$ 100	$/hr
Subtotal	**$ 7,000**	**$ 28,000**	**$ 28,000**	**$ 22,800**		**$ 320,000**				
Overall Costs										
Total	**$ 96,475**	**$ 195,210**	**$ 223,920**	**$ 185,000**		**$ 2,599,000**				

Figure A-1
Adaptive Management Annual Costs

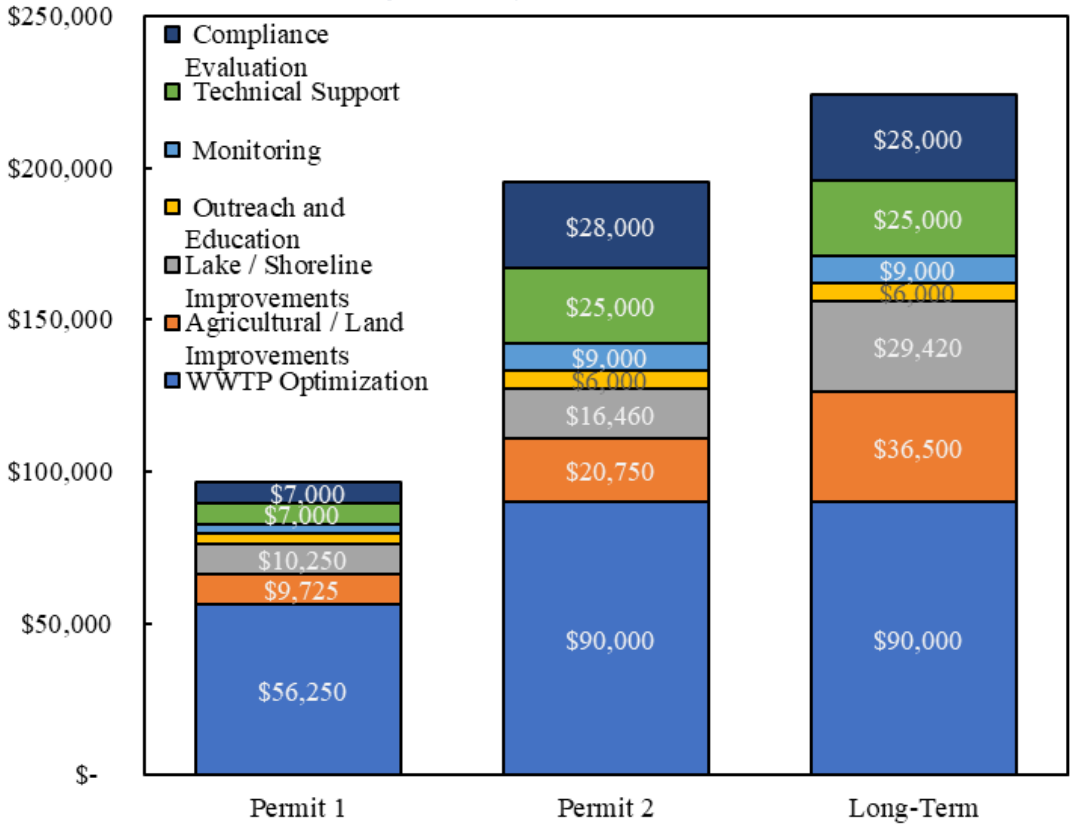
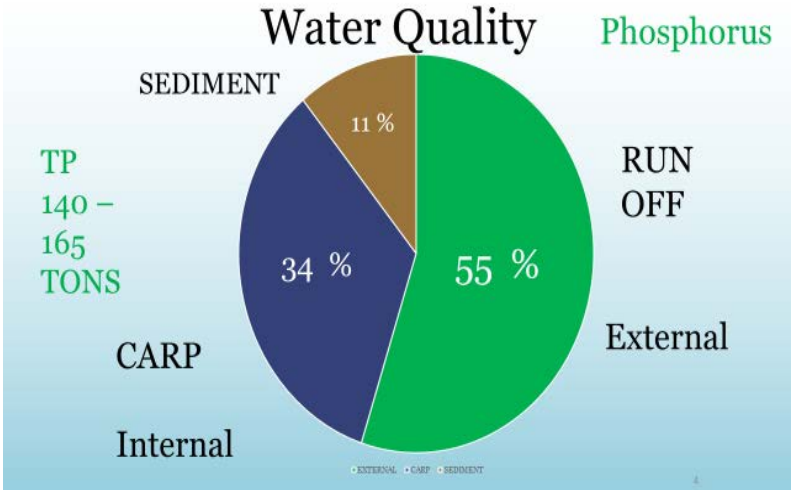


Table A-2
Beaver Dam Watershed
Rock River TMDL Allocations

		Nonpoint	MS4	WWTF	Total
Reach 34	Baseline	60	51	10,994	11,105
	Allocation	38	10	6,513	6,561
	Reductions	**22**	**42**	**4,481**	**4,545**
Reach 33	Baseline	4,467	1,145	1,528	7,140
	Allocation	2,948	813	1,192	4,953
	Reductions	**1,519**	**332**	**336**	**2,187**
Reach 82	Baseline	1,337			1,337
	Allocation	802			802
	Reductions	**535**	-	-	**535**
Reach 32	Baseline	525			525
	Allocation	383			383
	Reductions	**142**	-	-	**142**
Total	Baseline	6,389	1,196	12,521	20,106
	Allocation	4,171	823	7,705	12,698
	Reductions	**2,217**	**374**	**4,817**	**7,408**

Figure A-2
Beaver Dam Lake
Phosphorus Loading



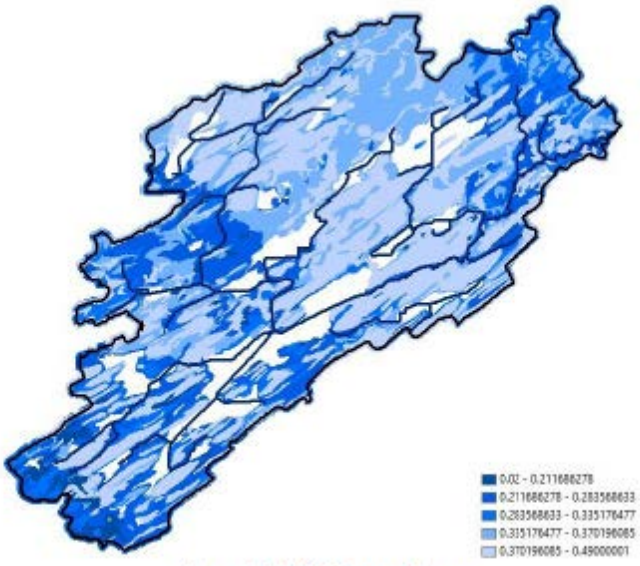
Source: Beaver Dam Lake Improvement Association

Table A-3
Dodge County and Columbia County
Land Use

Land Use	Dodge County		Columbia County	
	Acres	%	Acres	%
Corn	157,366	27	139,286	27
Soybeans	84,683	15	52,727	10
Wetlands	109,657	19	84,824	17
Open Water	22,316	4	15,952	3
Developed	41,549	7	33,183	7
Grass/Pasture	56,975	10	33,981	6
Hay	46,995	8	28,999	5
Forest	38,411	7	108,063	19
Other Crops	18,795	3	9,759	2
Miscellaneous	3,761	1	2,063	0
Total	**580,529**	**100**	**509,225**	**100**
Total Cropland	**307,839**	**53**	**230,768**	**45**

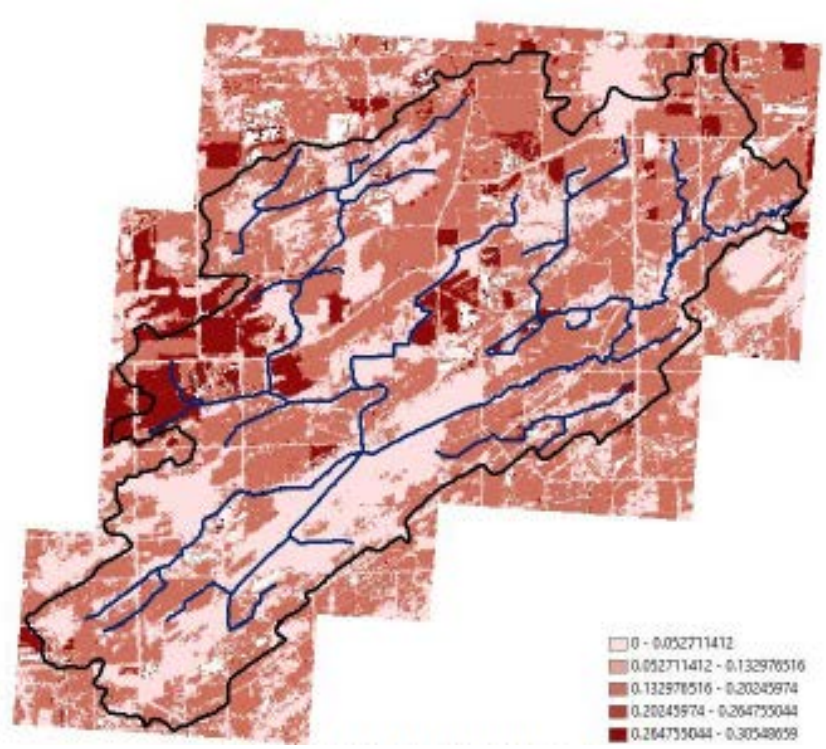
Source: USDA CropScape

Figure A-3
Beaver Creek Subwatershed
K-Factor Values (Soil Erodibility)



Source: Beaver Dam Lake Improvement Association

Figure A-4
Beaver Creek Subwatershed
C-Factor Values (Continuous Cover)

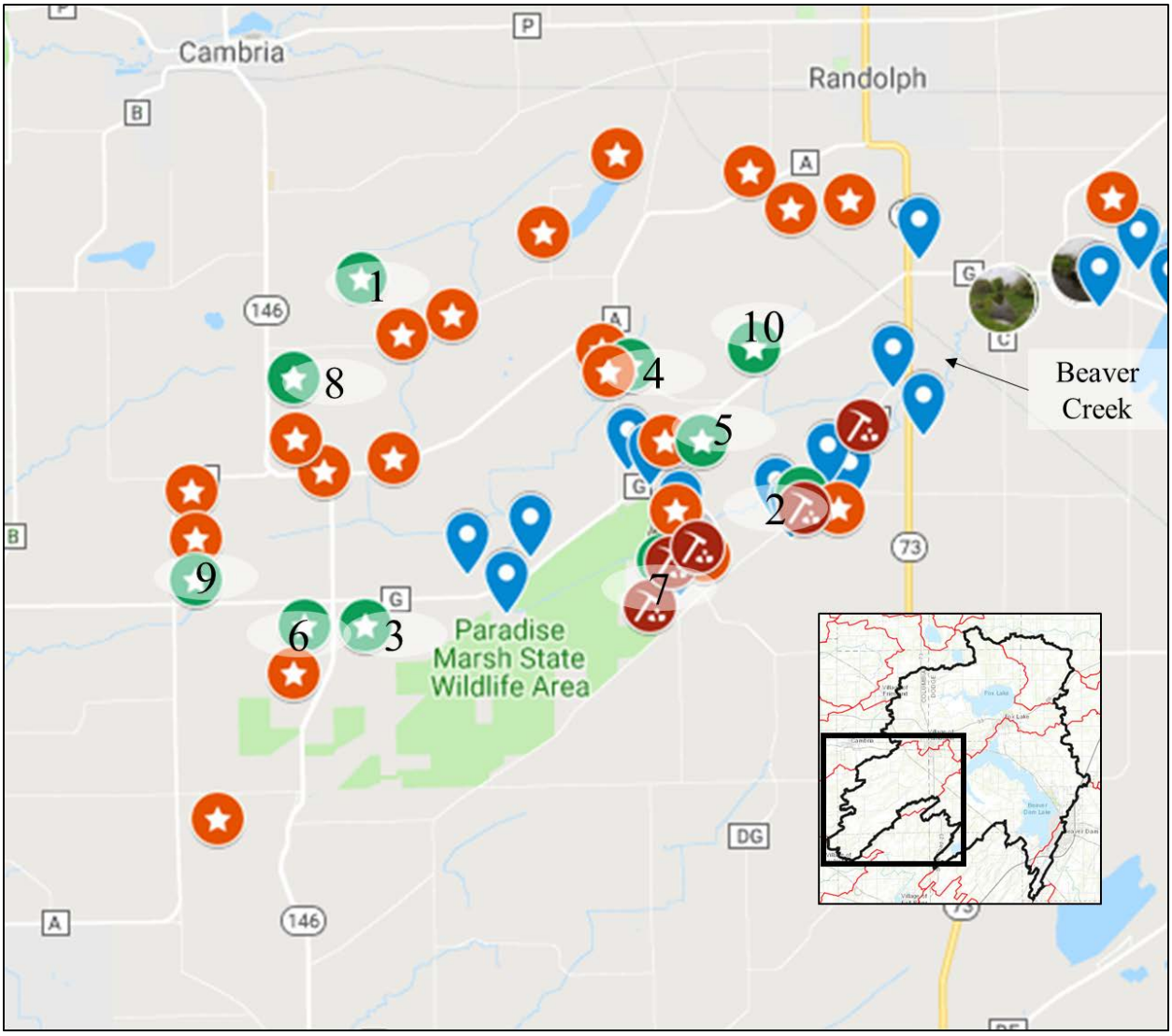


Source: Beaver Dam Lake Improvement Association

Table A-4 Beaver Dam Subwatershed Critical Source Areas								
Overall Rank	**Site**	**Acres**	**Rank**	**EVI**	**Rank**	**Proximity to Water (m)**	**Rank**	**Average Rank**
1	6.5	77	5	8.5	4	0	1	3.3
2	24	79	3	8	9	10	2	4.7
3	15	193	1	9	3	86	13	5.7
4	19	72	6	8.4	5	100	16	9
5	22	55	10	7.5	15	46	3	9.3
6	14	59	8	9.4	1	190	20	9.7
7	Field 2	57	9	7.9	10	84	12	10.3
8	8	79	4	6.6	20	76	9	11
9	11	50	12	7.5	14	68	7	11
10	20	47	13	8.1	8	95	14	11.7
11	23	25.76	20	8.2	7	76	10	12.3
12	13	83.51	2	6.5	21	112	17	13.3
13	18	35.12	17	9.2	2	198	21	13.3
14	5	37.17	16	6.2	22	50	4	14
15	16	59.13	7	7.7	12	500	26	15
16	6	42.05	15	6	24	63	6	15
17	7	17.35	21	6.7	19	58	5	15
18	21	51.51	11	7.8	11	432	24	15.3
19	Area 1	42.24	14	6.8	18	97	15	15.7
20	25	17.34	22	8.3	6	488	25	17.7
21	17	1.96	28	6.8	17	75	8	17.7
22	2	34.74	18	4.8	28	82	11	19
23	1	29.31	19	7.5	13	630	27	19.7
24	3	11.85	25	6.1	23	143	19	22.3
25	9	15.96	23	5.7	27	138	18	22.7
26	Field 1	2.29	27	7.2	16	Internally Drained	28	23.7
27	4	14.76	24	5.8	26	296	22	24
28	10	8.49	26	5.9	25	368	23	24.7
Total		**1299**						
Top 10		**769**						
Average Total		**46**		**7.3**		**169**		
Average Top 10		**77**		**8.1**		**76**		

Source: Beaver Dam Lake Improvement Association

Figure A-5
Beaver Creek Subwatershed
Critical Source Areas



Source: Beaver Dam Lake Improvement Association

Table A-5
Beaver Dam Lake Shoreline Inventory

	Location	Type	Inflow	Condition	Action Steps
1	**City of Beaver Dam**	**LD Res**	**Various**	**BD under stormwater runoff permit**	
				Shoreline zoning ordinance 1-2015	BDLIA review with Building Inspector
1.1	Lakeshore Hospital	HD Res		Renovation in 2019	BDLIA review shoreline restoration
					Potential Healthy Lakes Program
2	**Edgewater**	**Rip Rap & Nat**			**Healthy Lakes 2017, native**
				No significant culvert along 33 from B to Fox Lake	
2.1	Edgewater DR	LD Res		Severe shoreline erosion	Property transfer in 2016, construction 2018
2.2	Culvert fm Industrial Park	Culvert	< 48 in		
2.3	Park Spilway & drainage	Culvert	< (2) 24 in	Carp concentration point	BDLIA to harvest 2018
3	**McKinley**	**Rural Res**	**8 ft w/**	**Carp concentration point**	**BDLIA to harvest in 2019**
			48 in clea	Potential for bar grate east side	2017 & 2018 spawning verified
4	**BD Golf Course**	**Culvert**	**5 ft**	**Invert exit restricts rough fish**	**2018 report of heavy carp spawning**
				Install grate cover east side	
5	**Sunset Beach**	**Rural Res**		**Mostly rip rap**	
6	**Fish Camp**	**Natural**	**creek**	**Erosion of wetlands**	**Investigate in winter**
6.1	Fish Camp Dam			E of Fisher Isl	Check in winter
6.2	Guetchell Spring/Creek	culvert @ RR	4246 A.	N.E to Hwy 33, 1500 ft N of Fish Camp	
6.3		cuvert @ RR			
7	**Dunn Rd**	**Rural Res**			
8	**Puckagee Springs/ Creek**	**Natural**	**creek**	**Extreme shoreline erosion**	**BDLIA survey 2018**
		1080 A.	RR Bridge	Cold water inlet <10 F> 15 cfs	MARS to prepare plan & drawing
9	**Trestle Bay**		**RR Bridge**	**Carp barrier in poor repair**	**BDLIA repaired bar grates 2016**
				Bridge detail, 2k A	Commercial harvest 2016, 41,000 lbs
					DNR Biologist to assess BMPs
10	**Mill Rd Ramp**	**Rip rap**		**Shoreline runoff and ramp damage**	**WDNR & BDLIA grub out & grass**
				Natural creek west of parking	2017 stone barrier at ril line
11	**Mill Creek**	**Natural**		**Fox Lake watershed 40k A, 40%**	
11.1	Cty Rd C	culvert		At Creek midway	
11.2	Cty Rd C	culvert		South of Cty Rd P	
11.3	Wis Souther RR Trestle	bridge			
11.4	West Fox Rd	bridge			
12	**Cty Rd FW**	**Rural Res**			**Note: 1600 lft of improved shore, buffer strip, rip rap, cut back slope**
12.1	N9196 Cty Rd FW			Severe shoreline erosion	Note: 1600lft of improved shore
12.2	Cty Rd FW	culvert			
12.3	Cty Rd FW	culvert		South of Cty Rd C	

Table A-5 Beaver Dam Lake Shoreline Inventory					
	Location	Type	Inflow	Condition	Action Steps
13	**Beaver Creek**	**Mixed**	**Bridge**	**See WRM Program & bridge detail**	**See WRM survey locations**
				BC watershed, 20k A	
14	**Rakes Bay**	**Natural**		**Storm event with high TP**	**BDLIA prelimianry survey**
		9200 A.	Bridge	9k A, pulse flow, Aquatic vegetation	MARS to prepare drawings, CH 30 permit 2018
	W. Bay inlet Cty Rd FW	1607 A.			ENCLOSURE 4
	Lost Lake	1923 A.			
14.1	Cty Rd G	culvert		N of Bridge	BDLDC w/ partial funding of barrier, 2100 lft from wetland, drains 200 A. natural wetland
15	**Hickory Point**	**Rural Res**			
16	**Sunny Point**	**Rural Res**		**2k A**	
		Culvert	< 36 in	Heavy Ag runoff with P & >T	
17	**Gilfins Bay**	**Natural**			**Investigate shore in winter**
18	**Cty Rd. CP**	**Rural Res**			
18.1	Derge Park	Culvert	24 in	Inflow approx 300 A	Potential for Sediment Trap
18.2	North of Derge Park	Culvert			
18.3	Derge Park	Shoreline		Primarily rip rap	Water lillies in bay
18.4	Stone Ledge RD	culvert			Drains 175 ft to pond
19	**Weiss Bay**	**Natural**	**creek**		**CWH installation 2017 -18, Extensive upland wetland**
19.1	Cty Rd G	box culvert		Creek / wetland N of CC	
19.2	Cty Rd G	culvert		S of CC	
20	**Beaver Bay**	**Rural Res**		**Rip rap shoreline**	
20.1	Cty Rd G	Culvert		Fixed carp barrier east of G	Low priority
20.2	Edgewater	Culvert		Drains 80 + A	Good potential for T reduction
21	**Millers Woods**	**Rural Res**		**Rip rap shoreline**	
21.1	Rose Circle	culvert	12 in		Low priority
22	**Conservation Bay**	**Natural;**		**Shoreline erosion**	**BDLIA to monitor**
				Heavy Ag runoff & > T, two creeks	Converted to CREP in 2016
22.1	Cty Rd G	culvert		Entry via wetland and woods	Low priority
22.2	Cty Rd G	culvert		Entry via conservation CREP	Low priority
22.3	Town of BD Mathias	natural shore		Shoreline eroison see ortho 2006	Potential for native planting
23	**Town of BD**	**Natural**	**creek**		
23.1	Cty Rd G	culvert		Entry via creek and wetlands	Invesigate in winter
23.2	Cty Rd G	culvert		At Airport Rd through Marina grasses	High flow at rain events
23.3	Airport Rd	Natural	creek	Rural residential	
24	**Bayside**		**Bridge**	**approx 1k A**	

Table A-6 Representative Farms, Beaver Dam Watershed SnapPlus Modeling Results, Cropland Management Practices										
Farm	**Acreage**	**Simulated Phosphorus Loss (PTP, lb P/year)**							**% of Tilled Acres in Watershed**	
		Intensive Tillage	**Reduced Tillage**	**Weighted Average Tillage**	**Cover Crop**	**Cover Crop Reduction**	**No Till**	**No Till Reduction**	**Intensive Tillage**	**Reduced Tillage**
Gibbs	63	5.5	2.6	**3.6**	2.0	**1.6**	0.3	**3.3**	33%	67%
Jacobs	77	6.4	3.0	**4.1**	2.3	**1.8**	0.3	**3.8**		
Minnig	146	2.0	1.0	**1.3**	0.8	**0.5**	0.2	**1.1**		
Welch	55	2.0	1.0	**1.3**	0.8	**0.5**	0.2	**1.1**		
Total	**341**	**3.6**	**1.7**	**2.4**	**1.4**	**1.0**	**0.3**	**2.1**		

ANALYTE: Total Phosphorus **Revision Date: February 4, 2019**

The SOP must be read completely and followed by laboratory staff doing analysis. See the procedure page for daily use.

1) Applicable Matrices and Sensitivity

These procedures cover the determination of specified forms of phosphorus in domestic wastes. The method is applicable in the range from 0.05 to 1.5 mg P /L, depending on the test range of the TNTplus Phosphorus kit.

The method detection limit is determined annually using the procedure specified in 40 CFR Part 136.

2) Scope and Application

Hach 10209/10210 uses the Hach 843 vials and is an Ascorbic Acid Method. Ammonium molybdate and antimony potassium tartrate react in an acid medium with dilute solutions of phosphorus to form an antimony-phospho-molybdate complex. This complex is reduced to an intensely blue-colored complex by ascorbic acid. The color is proportional to the phosphorus concentration and is measured at 880 nm.

3) Interferences

Arsenates is determined similarly to phosphorus and should be considered when present in concentrations higher than phosphorus. High iron concentrations can cause precipitation of and subsequent loss of phosphorus.

4) Equipment and Supplies

a) HACH DR 3900 Spectrophotometer
b) Hach DRB 200 Reactor capable of heating to 150 Deg C.
c) Class A pipettes, 2 mL serological disposable pipets
d) 50 mL and 100 mL Volumetric flasks
e) 50 mL, 100 mL and 150 mL beakers
f) Test tube racks
g) HACH TNT Plus 843 Test Kit

5) Reagents and Standard

a) HACH TNT Plus 843 Test Kit 0.05 – 1.5 mg/L
b) Sulfuric Acid 5N
c) Sodium Hydroxide 5N
d) Phosphate Standard 5 ppm as P
e) Phosphate Standard 1 ppm as P
f) pH strips 0.0 – 6.0 for preservation verification, 5.5 – 8.0 for neutralizing verification.
g) Proficiency Test samples
h) Calibration Standards. Prepare the following calibrations Standards by adding the appropriate volume of 5.0 mg/L stock standard solution. See the calibration section for more details.
i) The Verification Standard is made from a different lot # from the calibration standards.

6) Sample Collection, Preservation, Shipment, and Storage

a) Resistant-glass or plastic bottles may be used for sample collection. Containers should be cleaned with a non-phosphate detergent and water, and rinsed thoroughly with tap water. Bottles should then be rinsed with 10% hydrochloric acid (HCl) followed by tap water, and deionized or distilled water, rinse prior to sample collection.

b) Samples must be preserved by acidifying with 5N sulfuric acid (H_2SO_4) to a pH < 2 immediately after collecting and refrigerating at $\leq$ 6ºC (unless analyzed immediately). Generally 1.0 mL of 5N H_2SO_4 per 200 mL of samples is sufficient to reduce the pH to <2. Sample pH is verified and noted on the bench sheet.

7) Quality Control

a) Calibrate every year or sooner if needed. Analyze an initial calibration verification standard (ICV) after calibration from a second source standard. Calibration r-value is required to be $\geq$ 0.995, if not re- calibrate.

b) New calibrations are recorded on bench sheets and maintained on file along with the annual LOD check.

c) Perform an initial demonstration of capability (IDC) for each analyst once as specified in the Quality Manual and document in the analyst's training file. Analyst must successfully complete the IDC before performing any wastewater compliance samples.

d) Determine (verify) the LOD yearly.

i) Initial Method Detection Limit capability: Demonstrate the ability to generate acceptable data by analysis of the following: at least 7 replicate standards (blank spikes), prepared (and analyzed) over at least three days. Prepare and analyze at least 7 method blanks over at least 3 days. The LOD of the standards and the LOD of the blanks is calculated and the higher of the two results is the LOD.

ii) The Ongoing MDL / LOD is determined by preparing the same concentration of the replicate standard as in the above paragraph. These are digested and analyzed the same as samples. At least 2 replicates are run (on separate days) in each quarter. At the end of the year there will be 8 replicates. Collect all method blank results. Use the WDNR spreadsheet for the calculations. Repeat this process each year. If the MDL / LOD is within 2 times the previous LOD, then decide which to use. If it is outside the 2x allowance, then use the new LOD.

e) Analyze a proficiency testing (PT) sample once per year.

f) Digest and Run a method blank (MB) at the beginning of each run of samples, blank must be $\leq$LOD. If not, re-analyze, if still out of range, qualify data.

g) Analyze a continuing calibration check standard (CCV)/ Laboratory Control Standard (LCS) each date when performing testing. This standard is required per each preparation and analysis up to 20 samples. The recovery must be 90-110% in order to accept the sample results.

8) Calibration

a) Using Class A pipettes make the following standards in volumetric flasks.

b) Blank- no standard (Calibration Blank) - Top line 2 mL DI Water

c) Calibration Standards. 0.20, 0.40, 0.60, 0.80, 1.00 , 1.50 ppm (the stock @ room temperature)

Prepare the following calibration standards by adding the appropriate volume of 5.0 mg/L stock standard solution to volumes listed below. Bring to volume with de-ionized water.

Desired Concentration mg/L as P	mL of 5.0 mg/l Stock Standard	Final Volume (mL)
0	0	2 (cal. Blank – DI Water)
0.2	2	50
0.4	4	50
0.6	6	50
0.8	8	50
1.0	10	50
1.5	15	50

ICV/LCS phosphate solution, 0.5 mg/L P – second source stock standard 1.0 mg/L as P
CCV/LCS phosphate solution 0.5 mg/L P - second source stock standard 1.0 mg/L as P

d) Verify the temperature reaches 150^{o}C and record on the benchsheet.

e) Follow the Hach method in procedure section to digest standards. See procedure section.

Quick Summary:

f) Setup spec by selecting single wavelength and make sure it is set to 880 nm.

g) Spec should display that it will read in absorbance mode.

h) Zero spectrophotometer with Blank sample (DI water) with no reagents added.

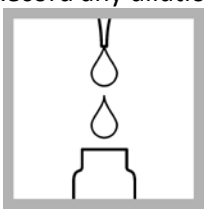
i) Again invert vials to ensure sample is well mixed then wipe outside of vials clean with a kim wipe. Insert method blank vial. Read absorbance value and record on bench sheet.

j) Use the same procedure for each vial.

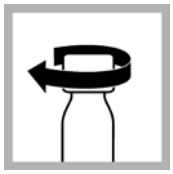
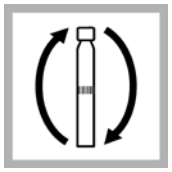
k) Enter values in new Phosphorus workbook in excel spreadsheet. If calibration passes, save as Phos + date of calibration and use the worksheets in that workbook for calculation of concentrations. Make copies of Phos calibration bench sheet to store in calibration binder.

9) Procedure:

a) Warm samples to room temperature
b) All preserved samples need to be neutralized prior to setting up samples.
Add 5N Sodium Hydroxide to preserved sample using disposable transfer pipette until pH is 7.
c) Use the same amounts of reagents as used to preserve the Phosphorus sample.
d) Record pH after adjusting to the bench sheet. Amount of reagents should not exceed 5% of sample volume.
e) Turn on the COD reactor. Heat to 150ºC .
f) Record your sample data on worksheet
g) Set up the vials needed
h) Prepare CCV standard (Continuing Calibration Standard) / LCS (Laboratory Control Standard) Analyze CCV/LCS standard once per day (for up to max of 20 samples). Pipette 1.0 mL of 1 ppm Phosphate standard into a Reagent Set vial using class A pipette. Add ml of DI water to same vial using a class A pipette. This is the 0.5 ppm CCV/LCS.
i) 2ml DI water is the method blank.
j) Carefully remove the lid from the Dosicap zip cap. Remove the cap from the test vial. Fill with 2 ml of samples / standards using a Class A pipette. Do this for all samples and standards. (Effluent may call for dilution so plan ahead and pre-dilute the sample if needed, for example 25ml up to 50ml of DI water in 50ml vol flask=2x). Record any dilutions made for samples.

k) Turn the Dosicap Zip over the test vial so the reagent side goes on the vial. Tighten the cap on the vial.
l) Shake the vial 2-3 times to dissolve the reagent in the cap. Look through the open end of the Dosi-cap to make sure the reagent is dissolved.
m) Record the temperature of the hotblock/reaction block on the benchsheet (148-152°C is ok).
n) Heat vials for 30 minutes in COD reactor at 150° C. Set timer.
o) Remove vials form the reactor immediately after **30** min. and allow cooling to room temp.
p) Remove caps and add .2ml of HACH supplied reagent (solution B) to vials.
q) Put a grey Dosicap on and invert several times to mix and dissolve reagent.
Pictures for p, q:

r) Set timer for **10** minutes.
s) When timer goes off, turn on the HACH DR 3900 spectrophotometer (make sure wavelength is at 880nm).
t) Insert zero blank, which consists of DI water (use same zeroing procedure as for calibration) and place into vial holder with cover over the sample cell receptacle.
u) Press zero to Zero machine
v) Proceed with each: CCV/LCS, then the MB, then the samples. Make sure to clean vials with a Kim wipe, insert into spectrophotometer.
w) Record absorbance on to the Phos spreadsheet.
NOTE: If the absorbance of the sample is above the absorbance of the high standard, the sample must be pre-prepared. Dilute as needed, follow all steps above and then reanalyze it.

10) Corrective Action for Out-of-Control or Data

a) Any blank that exceeds above the MDL, the analyst must re-mix and re-analyze the blank. If the blank is still above the MDL/LOD then any sample results that are not 10x higher than the blank concentration are qualified. For example: "the method blank result was above the LOD and the result was…., affected samples were sampled on …. - …."

b) CCV and LCS standards must fall within 10% of true value (90%-110% Recovery). If not re-mix and re-analyze, if still out of range re-calibrate.

c) A corrective action report must also be filled out for any MB failures.

Detailed Calibration to Create Curve:

Glassware: 7 – 150 mL glass beakers, 6 – 50 mL flasks

1. Fill each 50 mL flask approximately ½ full with DI Water
2. Fill the "Zero" blank (the 7th beaker) approximately ¾ full with DI Water
3. Draw phosphate standard 5 PPM as P (the amount specified above in section 8 above), add to the 6 50 mL flask
4. Top off each flask to the 50 mL line with DI water
5. Place stoppers on each flask, mix well
6. Transfer the solution in each of 6 flasks into the 6 beakers
7. Start heat on the DRB 200
8. Label each TNT 843 vial which solution will be placed (Zero blank, 2, 4, 6, 8, 10, 15)
9. Add 2 mL of solution from appropriate beaker to appropriate labelled 843 vial. (CHANGE PIPETTE BETWEEN EACH SAMPLE)
10. Place green dosi-cap on each vial, mix
11. Place all 7 vials in DRB 200 for 30 minutes at 15O deg C
12. Program DR 3900 for calibration curve
    a. Turn on the DR 3900 to the Main Menu screen
    b. **Press** the User Programs button
    c. **Press** the Program Options button
    d. **Press** the New button
    e. Assign a number for the new calibration (unique number between 9001 – 9099), **press** OK
    f. Enter a Program Name (example Phos 2019), **press** Next
    g. Enter Single Wavelenth, **press** Next
    h. Enter mg/L, **press** Next
    i. Enter Wavelength 880, **press** Next
    j. Enter Resolution of .001, **press** Next
    k. Enter the Chemical form – enter **P**, **press** Next
    l. Enter Read Standards, **press** Next
    m. Enter curve data for zero and the 6 calibration standards
        i. **Press** the **+** button and enter 0.0000, then **press** OK
        ii. **Press** the **+** button and enter 0.2000, then **press** OK
        iii. Repeat this for the remaining 5 concentrations (.4, .6, .8, 1.0, 1.5)
    n. After 30 minutes in heater, remove all vials allow to cool to room temperature in vial rack.
    o. Add 0.2 mL of TNT 843 B to the Zero vial once it has reach roomed temperature (NOTE DOSI-CAP C NOT PLACED ON ZERO BLANK)
    p. Highlight the 0.0000 line on the DR 3900, **press** the **Zero** button
    q. Add 0.2 mL of TNT 843 B to each of remaining 6 vials, place the Dosi-cap C to each and mix
    r. **Set** timer to 10 minutes
    s. After 10 minutes, highlight the correct line on the DR 3900 for appropriate standard (using arrow button), **press** the **Read** button
    t. Repeat for each of the calibration standards.
    u. After the 6 standards have been read, **press** next and the curve will be shown, record info. Verify curve "r" value is .9995 or better
    v. **Press** Done
    w. **Press** Store
    *****To review curve data: User Programs, Highlight Curve, Program Options, Edit, Highlight Calibration Curve …., Edit, Enter Values, OK, Next (to see the curve)**
    x. This phosphorus curve can now be used for testing under the User Programs tab from the Main Menu

Detailed Testing Procedure:

TNT 843 Vials needed: **8**

1 Zero Blank
1 Method Blank
1 Raw
3 Effluent (3 dates)
1 LCS
1 2nd source LCS

1) Warm samples to room temperature
2) All preserved samples need to be neutralized prior to setting up samples.
   Add approximately 1.6 ml 5N Sodium Hydroxide to preserved sample using disposable transfer pipette until pH is 7 (preserved sample size = 500 ml).
3) Verify pH after adjusting on the bench sheet. Amount of reagents should not exceed 5% of sample volume.
4) Turn on the DRB 200 reactor. Heat to 150ºC.
5) Record your sample data on bench sheet
6) Place the number of vials needed in vial rack. Label each vial
7) Remove the green cap from each test vial. Fill with 2 mL of samples / standards using a Class A pipette. Do this for all samples and standards. Record any dilutions made for samples (Influent sample dilution of 10).
8) Zero blank and method blank receive 2mL of DI water
9) Prepare CCV standard (Continuing Calibration Standard) / LCS (Laboratory Control Standard) Analyze CCV/LCS standard once per day (for up to max of 20 samples). Pipette 1.0 mL of 1 ppm Phosphate standard into a Reagent Set vial using class A pipette. Add 1 ml of DI water to same vial using a class A pipette. This is the 0.5 ppm CCV/LCS.
10) Turn the Dosicap Zip over each test vial so the reagent side goes on the vial. Tighten the cap on each vial.
11) Shake each vial 2-3 times to dissolve the reagent in the cap. Look through the open end of the Dosi-cap to make sure the reagent is dissolved.
12) Record the temperature of the hotblock/reaction block on the benchsheet (148-152°C is ok).
13) Heat vials for 30 minutes in DRB 200 reactor at 150° C. Set timer.
14) Remove vials form the reactor immediately after **30** min. and allow cooling to room temp.
15) Remove caps and add .2ml of HACH supplied reagent (solution B) to all vials, including zero blank.
16) Put a grey Dosicap on and invert several times to mix and dissolve reagent on each vial, <u>EXCEPT the ZERO BLANK.</u>
    Set timer for **10** minutes.
17) When timer goes off, on the HACH DR 3900 spectrophotometer, **press** User Programs
18) Highlight the current calibrated phos program
19) **Press** Start
20) **NOTE:** wipe each vial with Kimwipe prior to placing in DR 3900
21) Insert zero blank, which consists of DI water
22) **Press** zero to Zero machine
23) Proceed with each: LCS, then MB, then the samples. Make sure to clean vials with a Kim wipe, insert into spectrophotometer. **Press** Read for each
24) Record concentration and absorbance on bench sheet. (Options button will scroll between conc. and abs.)

Beaver Dam Wastewater Treatment Plant --- Supplemental TP SOP

(July 16, 2019)

This Supplemental SOP will be considered as part of the existing Beaver Dam Wastewater Treatment Plant TP SOP: Hach Method 10209/10210 – Standard Method 4500 PE-1999 with a revision date of February 4, 2019.

Adaptive Management Plan – In Stream Sampling – Phosphorus Analysis

1) **Sample Collection –** Sample collection sites will be specified in the Adaptive Management Plan. Sites that have been chosen are to demonstrate compliance under Adaptive Management.

2) **Monitoring Frequency** – Samples will be collected every Thursday once/week during the months of May through October of each year.

3) **Responsible Sampling Program Personnel** – Primary sampling responsibilities will be handled by Beaver Dam Utilities staff. The following personnel will be responsible for collecting the samples for in stream monitoring of phosphorus:
    a. Primary sampler: Jim Riege, Wastewater Systems Operator
    b. Alternate Sampler: Jeremy Klug, Utilities Foreman
    c. Alternate Sampler: Jim Larson, Wastewater Systems Operator
    d. Primary Point of Contact: Rob Minnema, Director of Utilities

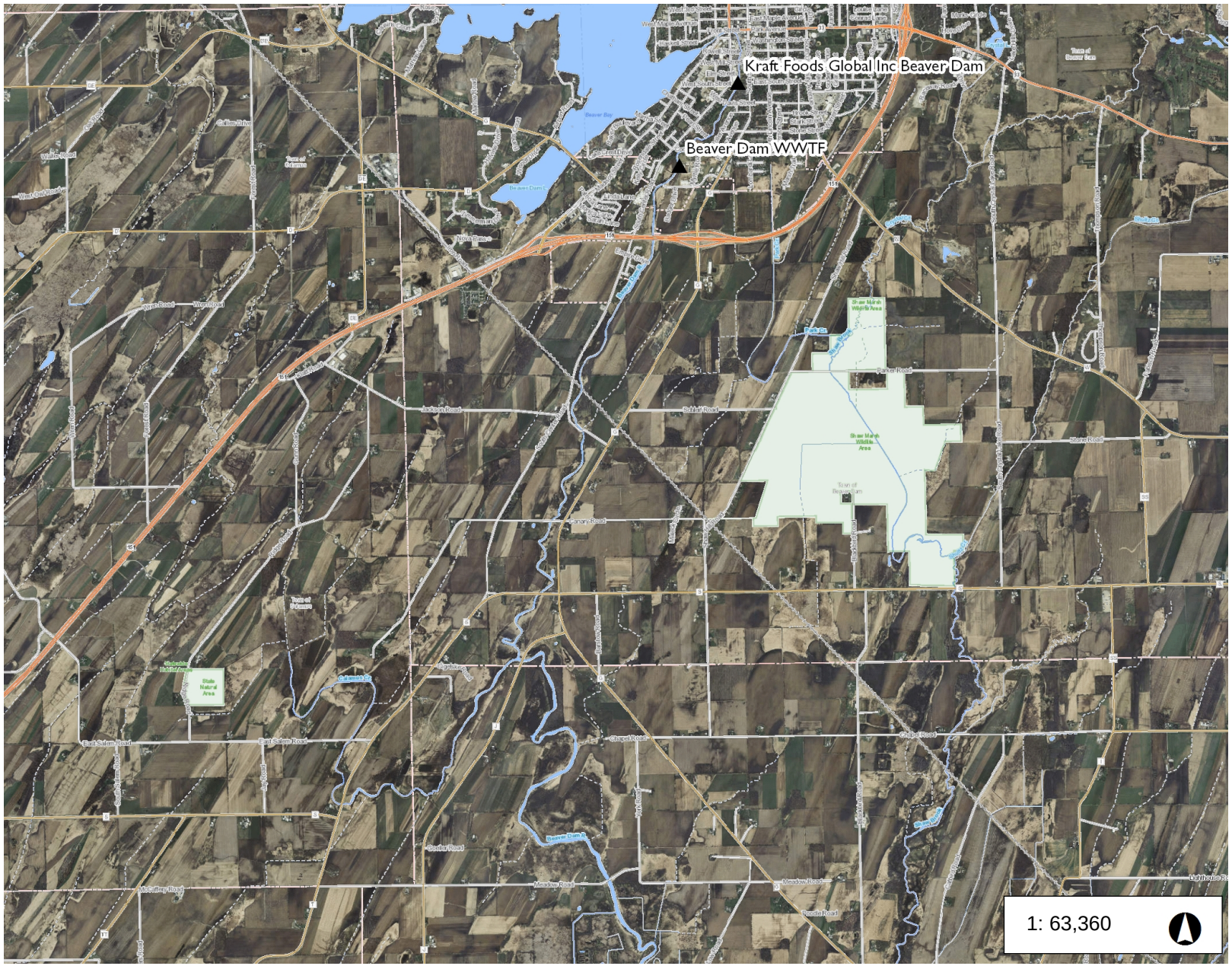
4) **Sample Preservation** – Samples will be preserved as specified in our existing TP SOP protocols (see attached TP SOP) which are outlined in Section 6.

5) **Quality Control** – Quality control protocols will be followed as specified in our existing TP SOP (see attached TP SOP) which are outlined in section 7.

6) **Sample Collection** – Sample collection methods will be followed as specified in the Adaptive Management Handbook. The following detailed protocols will be adhered to for sample collection:
    a. Samples will be collected in the portion of the stream with the greatest or strongest flow
    b. Samples will be collected at a depth of 3-6 inches below the surface using triple rinsed sample bottles, completely filling the sample bottle
    c. The sampler will avoid disturbing the sampling site during sample collection
    d. The sampler will use public access points for sample collection or if necessary, seek permission from private landowners if access is needed

7) **Sample Analysis** – Samples will be analyzed following the protocols as specified in our existing TP SOP (see attached TP SOP) which are outlined in sections 1-8. The Beaver Dam Wastewater Laboratory is certified by the State of Wisconsin for Phosphorus Analysis.

Beaver Dam River: Beaver Dam Lake to Calamus Creek



Legend

▲ Surface Water Outfalls

Notes

2.0 0 1.00 2.0 Miles

NAD_1983_HARN_Wisconsin_TM

Beaver Dam River at County Hwy S

Legend

Notes

0.3 0 0.13 0.3 Miles

NAD_1983_HARN_Wisconsin_TM

APPENDIX B:
WPDES PERMIT

WPDES PERMIT

STATE OF WISCONSIN
DEPARTMENT OF NATURAL RESOURCES

PERMIT TO DISCHARGE UNDER THE WISCONSIN POLLUTANT DISCHARGE ELIMINATION SYSTEM

CITY OF BEAVER DAM

is permitted, under the authority of Chapter 283, Wisconsin Statutes, to discharge from a facility located at
108 MYRTLE ROAD, BEAVER DAM, WISCONSIN
NEQ, NEQ, Section 8, T11N, R14E
to
BEAVER DAM RIVER (BEAVER DAM RIVER WATERSHED, UR03 – UPPER ROCK RIVER BASIN) IN DODGE COUNTY

in accordance with the effluent limitations, monitoring requirements and other conditions set forth in this permit.

The permittee shall not discharge after the date of expiration. If the permittee wishes to continue to discharge after this expiration date an application shall be filed for reissuance of this permit, according to Chapter NR 200, Wis. Adm. Code, at least 180 days prior to the expiration date given below.

State of Wisconsin Department of Natural Resources
For the Secretary

By _____
Tim Ryan
Wastewater Field Supervisor

_____
Date Permit Signed/Issued for Modification

PERMIT TERM: EFFECTIVE DATE - July 01, 2014 **EXPIRATION DATE - June 30, 2019**
EFFECTIVE DATE OF MODIFICATION: February 01, 2018

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1 Influent Requirements

1.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
701	Representative influent samples shall be collected after the grit chamber.

1.2 Monitoring Requirements

The permittee shall comply with the following monitoring requirements.

1.2.1 Sampling Point 701 - INFLUENT

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
BOD_5, Total		mg/L	3/Week	24-Hr Flow Prop Comp	
Suspended Solids, Total		mg/L	3/Week	24-Hr Flow Prop Comp	
Cadmium, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Chromium, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Copper, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Lead, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Mercury, Total Recoverable		ng/L	Monthly	24-Hr Flow Prop Comp	See the "Mercury Monitoring" section below.
Nickel, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Zinc, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	

1.2.1.1 Sample Analysis

Samples shall be analyzed using a method which provides adequate sensitivity so that results can be quantified, unless not possible using the most sensitive approved method.

1.2.1.2 Total Metals Analysis

Measurements of total metals and total recoverable metals shall be considered as equivalent.

1.2.1.3 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

2 In-Plant Requirements

2.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
107	In-Plant Monitoring - Collect the mercury field blank using standard sample handling procedures.

2.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

2.2.1 Sampling Point 107 - GEN PLANT (Hg blank)

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Mercury, Total Recoverable		ng/L	Monthly	Blank	See the "Mercury Monitoring" section below.

2.2.1.1 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

1 Surface Water Requirements

1.1 Sampling Point(s)

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
001	Representative effluent samples shall be collected at the chlorine contact tank, prior to discharge to the Beaver Dam River.
601	River flow of the Beaver Dam River shall be collected at the USGS flow gauge station.

1.2 Monitoring Requirements and Effluent Limitations

The permittee shall comply with the following monitoring requirements and limitations.

1.2.1 Sampling Point (Outfall) 001 - EFFLUENT

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow Rate		MGD	Continuous	Continuous	
BOD_5, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	January 1 through December 31
BOD_5, Total	Weekly Avg - Variable	mg/L	3/Week	24-Hr Flow Prop Comp	January 1 through December 31 - Report the daily BOD result in the BOD, Total column of the eDMR. Compare the weekly average variable BOD limit to determine compliance.
BOD_5, Variable Limit		mg/L	Weekly	See Table	Using the flow rate result, look up the weekly average variable BOD limit from the flow rate dependent table in the "Variable Limit" section below. Report the applicable weekly average BOD limit on the eDMR in the BOD, Variable Limit column.

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
BOD_5, Total	Weekly Avg - Variable	lbs/day	3/Week	Calculated	January 1 through December 31 - Report the daily BOD result in the BOD, Total column of the eDMR. Compare the weekly average variable BOD limit to determine compliance.
BOD_5, Variable Limit		lbs/day	3/Week	See Table	Using the flow rate result, look up the weekly average variable BOD limit from the flow rate dependent table in the "Variable Limit" section below. Report the applicable weekly average BOD limit on the eDMR in the BOD, Variable Limit column.
Suspended Solids, Total	Monthly Avg	30 mg/L	3/Week	24-Hr Flow Prop Comp	January 1 through December 31
Suspended Solids, Total	Weekly Avg - Variable	mg/L	3/Week	24-Hr Flow Prop Comp	January 1 through December 31 - Report the daily TSS result in the TSS column of the eDMR. Compare the weekly average variable TSS limit to determine compliance.
Suspended Solids, Variable Limit		mg/L	3/Week	See Table	Using the flow rate result, look up the weekly average variable TSS limit from the flow rate dependent table in the "Variable Limit" section below. Report the applicable weekly average TSS limit on the eDMR in the TSS, Variable Limit column.
Suspended Solids, Total	Monthly Avg	854 lbs/day	3/Week	Calculated	December 1 through January 31
Suspended Solids, Total	Monthly Avg	946 lbs/day	3/Week	Calculated	February 1 through February 28
Suspended Solids, Total	Monthly Avg	586 lbs/day	3/Week	Calculated	March 1 through March 31
Suspended Solids, Total	Monthly Avg	511 lbs/day	3/Week	Calculated	April 1 through April 30

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Suspended Solids, Total	Monthly Avg	460 lbs/day	3/Week	Calculated	May 1 through May 31 & September 1 through September 30
Suspended Solids, Total	Monthly Avg	469 lbs/day	3/Week	Calculated	June 1 through June 30
Suspended Solids, Total	Monthly Avg	377 lbs/day	3/Week	Calculated	July 1 through July 31
Suspended Solids, Total	Monthly Avg	410 lbs/day	3/Week	Calculated	August 1 through August 31
Suspended Solids, Total	Monthly Avg	527 lbs/day	3/Week	Calculated	October 1 through October 31
Suspended Solids, Total	Monthly Avg	603 lbs/day	3/Week	Calculated	November 1 through November 30
Suspended Solids, Total	Weekly Avg	1,195 lbs/day	3/Week	Calculated	January 1 through January 31
Suspended Solids, Total	Weekly Avg	1,333 lbs/day	3/Week	Calculated	February 1 through February 28
Suspended Solids, Total	Weekly Avg	826 lbs/day	3/Week	Calculated	March 1 through March 31
Suspended Solids, Total	Weekly Avg	720 lbs/day	3/Week	Calculated	April 1 through April 30
Suspended Solids, Total	Weekly Avg	649 lbs/day	3/Week	Calculated	May 1 through May 31 & September 1 through September 30
Suspended Solids, Total	Weekly Avg	661 lbs/day	3/Week	Calculated	June 1 through June 30
Suspended Solids, Total	Weekly Avg	531 lbs/day	3/Week	Calculated	July 1 through July 31
Suspended Solids, Total	Weekly Avg	579 lbs/day	3/Week	Calculated	August 1 through August 31
Suspended Solids, Total	Weekly Avg	743 lbs/day	3/Week	Calculated	October 1 through October 31
Suspended Solids, Total	Weekly Avg	850 lbs/day	3/Week	Calculated	November 1 through November 30
Suspended Solids, Total	Weekly Avg	1,204 lbs/day	3/Week	Calculated	December 1 through December 31
Suspended Solids, Total	Weekly Avg - Variable	lbs/day	3/Week	Calculated	January 1 through December 31 - Report the daily TSS result in the Suspended Solids, Total column of the eDMR. Compare the weekly average variable TSS limit to determine compliance.

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Suspended Solids, Variable Limit		lbs/day	3/Week	See Table	Using the flow rate result, look up the weekly average variable TSS limit from the flow rate dependent table in the "Variable Limit" section below. Report the applicable weekly average TSS limit on the eDMR in the Suspended Soilds, Variable Limit column.
Nitrogen, Ammonia (NH_3-N) Total	Daily Max	24 mg/L	3/Week	24-Hr Flow Prop Comp	November 1 through April 30
Nitrogen, Ammonia (NH_3-N) Total	Weekly Avg	16 mg/L	3/Week	24-Hr Flow Prop Comp	November 1 through March 31
Nitrogen, Ammonia (NH_3-N) Total	Weekly Avg	9.8 mg/L	3/Week	24-Hr Flow Prop Comp	April 1 through April 30
Nitrogen, Ammonia (NH_3-N) Total	Weekly Avg	9.4 mg/L	3/Week	24-Hr Flow Prop Comp	May 1 through May 31
Nitrogen, Ammonia (NH_3-N) Total	Weekly Avg	4.4 mg/L	3/Week	24-Hr Flow Prop Comp	June 1 through June 30
Nitrogen, Ammonia (NH_3-N) Total	Weekly Avg	4.0 mg/L	3/Week	24-Hr Flow Prop Comp	July 1 through July 31
Nitrogen, Ammonia (NH_3-N) Total	Weekly Avg	4.1 mg/L	3/Week	24-Hr Flow Prop Comp	August 1 through August 31
Nitrogen, Ammonia (NH_3-N) Total	Weekly Avg	5.6 mg/L	3/Week	24-Hr Flow Prop Comp	September 1 through September 30
Nitrogen, Ammonia (NH_3-N) Total	Weekly Avg	13 mg/L	3/Week	24-Hr Flow Prop Comp	October 1 through October 31
Nitrogen, Ammonia (NH_3-N) Total	Monthly Avg	6.0 mg/L	3/Week	24-Hr Flow Prop Comp	October 1 through March 31
Nitrogen, Ammonia (NH_3-N) Total	Monthly Avg	3.2 mg/L	3/Week	24-Hr Flow Prop Comp	April 1 through June 30
Nitrogen, Ammonia (NH_3-N) Total	Monthly Avg	2.0 mg/L	3/Week	24-Hr Flow Prop Comp	July 1 through July 31
Nitrogen, Ammonia (NH_3-N) Total	Monthly Avg	2.1 mg/L	3/Week	24-Hr Flow Prop Comp	August 1 through August 31
Nitrogen, Ammonia (NH_3-N) Total	Monthly Avg	2.9 mg/L	3/Week	24-Hr Flow Prop Comp	September 1 through September 30
Chlorine, Total Residual	Daily Max	38 µg/L	Daily	Grab	May 1 through September 30
Chlorine, Total Residual	Weekly Avg	8.6 µg/L	Daily	Grab	May 1 through September 30
Fecal Coliform	Geometric Mean	400 #/100 ml	2/Week	Grab	May 1 through September 30
pH Field	Daily Max	9.0 su	5/Week	Grab	
pH Field	Daily Min	6.0 su	5/Week	Grab	

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Dissolved Oxygen	Daily Min	6.0 mg/L	5/Week	Grab	
Phosphorus, Total	Monthly Avg	1.0 mg/L	3/Week	24-Hr Flow Prop Comp	Note that this is an interim limit. See the Phosphorus Limitation section below for the final water quality based phosphorus limits.
Phosphorus, Total		lbs/day	3/Week	Calculated	Calculate the daily mass discharge of phosphorus in lbs/day on the same days phosphorus sampling occurs. Daily mass (lbs/d) = daily concentration (mg/L) × daily flow (MGD) × 8.34.
Temperature Maximum		deg F	3/Week	Continuous	See "Effluent Temperature Limitations" section below.
Chloride		mg/L	4/Month	24-Hr Flow Prop Comp	Monitoring Only - January 1, 2018 - December 31, 2018. See "Chloride Sampling" section below.
Chloride		lbs/day	4/Month	Calculated	Calculate the daily mass discharge of chloride in lbs/day on the same days chloride sampling occurs. Daily mass (lbs/d) = daily concentration (mg/L) × daily flow (MGD) × 8.34.
Cadmium, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Chromium, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Copper, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Lead, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Mercury, Total Recoverable		ng/L	Monthly	24-Hr Flow Prop Comp	See "Mercury Monitoring" section below.
Nickel, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Zinc, Total Recoverable		µg/L	Monthly	24-Hr Flow Prop Comp	
Nitrogen, Total Kjeldahl		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Nitrite + Nitrate Total		mg/L	Quarterly	24-Hr Flow Prop Comp	
Nitrogen, Total		mg/L	Quarterly	Calculated	

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Acute WET		TU_a	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the "Whole Effluent Toxicity (WET) Testing" section below for monitoring dates & WET requirements.
Chronic WET		rTU_c	See Listed Qtr(s)	24-Hr Flow Prop Comp	See the "Whole Effluent Toxicity (WET) Testing" section below for monitoring dates & WET requirements.

1.2.1.1 Average Annual Design Flow

The average annual design flow of the permittee's wastewater treatment facility is 5.5 MGD.

1.2.1.2 Sample Analysis

Samples shall be analyzed using a method which provides adequate sensitivity so that results can be quantified, unless not possible using the most sensitive approved method.

1.2.1.3 Total Metals Analysis

Measurements of total metals and total recoverable metals shall be considered as equivalent.

1.2.1.4 Mercury Monitoring

The permittee shall collect and analyze all mercury samples according to the data quality requirements of ss. NR 106.145(9) and (10), Wisconsin Administrative Code. The limit of quantitation (LOQ) used for the effluent and field blank shall be less than 1.3 ng/L, unless the samples are quantified at levels above 1.3 ng/L. The permittee shall collect at least one mercury field blank for each set of mercury samples (a set of samples may include combinations of intake, influent, effluent or other samples all collected on the same day). The permittee shall report results of samples and field blanks to the Department on Discharge Monitoring Reports.

1.2.1.5 Chloride Sampling

A sample frequency of 4/month requires that samples be collected on four consecutive days each month. Any four consecutive days of sampling shall be exclusive to one week of a month; where Week 1 is days 1-7, Week 2 is days 8-14, Week 3 is days 15-21, and Week 4 is days 22-28.

1.2.1.6 Effluent Temperature Monitoring

For manually measuring effluent temperature, grab samples should be collected at 6 evenly spaced intervals during the 24-hour period. Alternative sampling intervals may be approved if the permittee can show that the maximum effluent temperature is captured during the sampling interval. For monitoring temperature continuously, collect measurements in accordance with s. NR 218.04(13). This means that discrete measurements shall be recorded at intervals of not more than 15 minutes during the 24-hour period. In either case, report the maximum temperature measured during the day on the DMR. For seasonal discharges collect measurements either manually or continuously during the period of operation and report the daily maximum effluent temperature on the DMR.

1.2.1.7 Effluent Temperature Limitations

Limits for Temperature, Maximum: The effluent limitations for "Temperature, Maximum" become effective immediately. Monitoring is required 3X/week upon permit reissuance. Daily maximum temperatures shall be reported so that applicable weekly average limits can be compared to the weekly averages of the reported daily maximum temperatures. However, so long as the flow rate is greater than what is listed in the following table, the weekly average limits are not in effect.

Effluent Limitations for 'Temperature Maximum':

Month	Receiving Water Flow Rate	Weekly Average Thermal Limit
April	15.1 cfs	58 ºF
September	4.9 cfs	78 ºF
October	6.1 cfs	68 ºF
November	13 cfs	62 ºF

1.2.1.8 Variable Limits

Substance	Notes	Weekly Avg.	Monthly Avg.
BOD_5 & TSS: May - Oct.	River Flow <5 cfs 5 - 8.9 cfs 9 -11.9 cfs 12 -15.9 cfs 16 -18.9 cfs >19 cfs	 11 mg/L (496 lbs/d) 13 mg/L (584 lbs/d) 16 mg/L (730 lbs/d) 19 mg/L (876 lbs/d) 22 mg/L (1021 lbs/d) 29 mg/L (1313 lbs/d)	30 mg/L
BOD_5 & TSS: Nov. - April	River Flow <5 cfs 5 - 7 cfs >7.1 cfs	 22 mg/L (992 lbs/d) 25 mg/L (1167 lbs/d) 29 mg/L (1313 lbs/d)	30 mg/L

1.2.1.9 TSS Limitation(s)

The Rock River TMDL for Total Phosphorus (TP) and Total Suspended Solids (TSS) was approved by the Environmental Protection Agency (EPA) September 2011. The TMDL derived limits are expressed as weekly average and monthly average effluents limits, and are effective immediately. The approved total suspended solids TMDL limits for this permittee are included in the following table:

Total Suspended Solids (TSS) Effluent Limitations

Month	Monthly Ave TSS Effluent Limit (lbs/day)	Weekly Ave TSS Effluent Limit (lbs/day)
Jan	854	1,195
Feb	946	1,333
March	586	826
April	511	720
May	460	649
June	469	661
July	377	531
Aug	410	579
Sept	460	649

Month	Monthly Ave TSS Effluent Limit (lbs/day)	Weekly Ave TSS Effluent Limit (lbs/day)
Oct	527	743
Nov	603	850
Dec	854	1,204

1.2.1.10 Phosphorus Limitation(s)

The Rock River TMDL for Total Phosphorus (TP) and Total Suspended Solids (TSS) was approved by the Environmental Protection Agency (EPA) September 2011. The TMDL derived limits are expressed as monthly average effluent limits. The approved total phosphorus TMDL limits for this permittee are included in the following table:

Total Phosphorus Effluent Limitations

Month	Monthly Ave Total P Effluent Limit (lbs/day)
Jan	2.26
Feb	2.57
March	2.36
April	2.49
May	2.41
June	2.55
July	2.46
Aug	2.45
Sept	2.45
Oct	2.32
Nov	2.35
Dec	2.26

1.2.1.11 Phosphorus Water Quality Based Effluent Limitation(s)

The final TMDL-derived water quality based effluent limits for phosphorus, as described above, will take effect July 1, 2023 unless:

(A) As part of the application for the next reissuance, or prior to filing the application, the permittee submits either: 1.) a watershed adaptive management plan and a completed Watershed Adaptive Management Request Form 3200-139; or 2.) an application for water quality trading; or 3.) an application for a variance; or 4.) new information or additional data that supports a recalculation of the numeric limitation; and

(B) The Department modifies, revokes and reissues, or reissues the permit to incorporate a revised limitation before the expiration of the compliance schedule*.

If Adaptive Management or Water Quality Trading is approved as part of the permit application for the next reissuance or as part of an application for a modification or revocation and reissuance, the plan and specifications submittal, construction, and final effective dates for compliance with the total phosphorus WQBEL may change in the reissued or modified permit. In addition, the numeric value of the water quality based effluent limit may change based on new information (e.g. a TMDL) or additional data. If a variance is approved for the next reissuance, interim limits and conditions will be imposed in the reissued permit in accordance with s. 283.15, Stats., and applicable regulations.

A permittee may apply for a variance to the phosphorus WQBEL at the next reissuance even if the permittee did not apply for a phosphorus variance as part of this permit reissuance.

Additional Requirements: If a water quality based effluent limit has taken effect in a permit, any increase in the limit is subject to s. NR 102.05(1) and ch. NR 207, Wis. Adm. Code. When a six-month average effluent limit is specified for Total Phosphorus the applicable averaging periods are May through October and November through April.

*Note: The Department will prioritize reissuances and revocations, modifications, and reissuances of permits to allow permittees the opportunity to implement adaptive management or nutrient trading in a timely and effective manner.

1.2.1.12 Alternative Approaches to Phosphorus WQBEL Compliance

Rather than upgrading its wastewater treatment facility to comply with WQBELs for total phosphorus, the permittee may use Water Quality Trading or the Watershed Adaptive Management Option, to achieve compliance under ch. NR 217, Wis. Adm. Code, provided that the permit is modified, revoked and reissued, or reissued to incorporate any such alternative approach. The permittee may also implement an upgrade to its wastewater treatment facility in combination with Water Quality Trading or the Watershed Adaptive Management Option to achieve compliance, provided that the permit is modified, revoked and reissued, or reissued to incorporate any such alternative approach. If the Final Compliance Alternatives Plan concludes that a variance will be pursued, the Plan shall provide information regarding the basis for the variance.

1.2.1.13 Submittal of Permit Application for Next Reissuance and Adaptive Management or Pollutant Trading Plan or Variance Application

The permittee shall submit the permit application for the next reissuance at least 6 months prior to expiration of this permit. If the permittee intends to pursue adaptive management to achieve compliance with the phosphorus water quality based effluent limitation, the permittee shall submit with the application for the next reissuance: a completed Watershed Adaptive Management Request Form 3200-139, the completed Adaptive Management Plan and final plans for any system upgrades necessary to meet interim limits pursuant to s. NR 217.18, Wis. Adm. Code. If the permittee intends to pursue pollutant trading to achieve compliance, the permittee shall submit an application for water quality trading with the application for the next reissuance. If system upgrades will be used in combination with pollutant trading to achieve compliance with the final water quality-based limit, the reissued permit will specify a schedule for the necessary upgrades. If the permittee intends to seek a variance, the permittee shall submit an application for a variance with the application for the next reissuance.

1.2.1.14 Whole Effluent Toxicity (WET) Testing

Primary Control Water: Beaver Dam River

Instream Waste Concentration (IWC): 73%

Dilution series: At least five effluent concentrations and dual controls must be included in each test.

- **Acute:** 100, 50, 25, 12.5, 6.25% and any additional selected by the permittee.
- **Chronic:**, 75, 50, 25, 12.5% and any additional selected by the permittee.

WET Testing Frequency:

Acute: tests shall be conducted every year in rotating quarters, in order to collect seasonal information about the discharge. Tests are required during the following quarters:

- *October 1, 2014 – December 31, 2014; January 1, 2015 – March 31, 2015; April 1, 2016 – June 30, 2016; July 1, 2017 – September 30, 2017; October 1, 2018 – December 31, 2018 & January 1, 2019 – March 31, 2019 (6 tests total)*

Acute WET testing shall continue at the frequency specified above until the permit is reissued. For example, the next test would be required in April 1, 2020 – June 30, 2020.

Chronic: tests shall be conducted every year in rotating quarters, in order to collect seasonal information about the discharge. Tests are required during the following quarters:

- *October 1, 2014 – December 31, 2014; January 1, 2015 – March 31, 2015; April 1, 2016 – June 30, 2016; July 1, 2017 – September 30, 2017; October 1, 2018 – December 31, 2018 & January 1, 2019 – March 31, 2019 (6 tests total)*

Chronic WET testing shall continue at the frequency specified above until the permit is reissued. For example, the next test would be required in April 1, 2020 – June 30, 2020.

WET testing shall be performed during normal operating conditions. Permittees are not allowed to turn off or otherwise modify treatment systems, production processes, or change other operating or treatment conditions during WET tests.

Reporting: The permittee shall report test results on the Discharge Monitoring Report form, and also complete the "Whole Effluent Toxicity Test Report Form" (Section 6, "*State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition*"), for each test. The original, complete, signed version of the Whole Effluent Toxicity Test Report Form shall be sent to the Biomonitoring Coordinator, Bureau of Water Quality, 101 S. Webster St., P.O. Box 7921, Madison, WI 53707-7921, within 45 days of test completion. The Discharge Monitoring Report (DMR) form shall be submitted electronically by the required deadline.

Determination of Positive Results: An acute toxicity test shall be considered positive if the Toxic Unit - Acute (TU_a) is greater than 1.0 for either species. The TU_a shall be calculated as follows: If $LC_{50} \geq 100$, then $TU_a = 1.0$. If LC_{50} is < 100, then $TU_a = 100 \div LC_{50}$. A chronic toxicity test shall be considered positive if the Relative Toxic Unit - Chronic (rTU_c) is greater than 1.0 for either species. The rTU_c shall be calculated as follows: If $IC_{25} \geq$ IWC, then $rTU_c = 1.0$. If $IC_{25} <$ IWC, then $rTU_c =$ IWC $\div IC_{25}$.

Additional Testing Requirements: Within 90 days of a test which showed positive results, the permittee shall submit the results of at least 2 retests to the Biomonitoring Coordinator on "Whole Effluent Toxicity Test Report Forms". The 90 day reporting period shall begin the day after the test which showed a positive result. The retests shall be completed using the same species and test methods specified for the original test (see the Standard Requirements section herein).

1.2.2 Sampling Point 601 - BEAVER DAM RIVER

Monitoring Requirements and Effluent Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Flow River		cfs	Daily	Measure	

1.2.2.1 River Flow

The permittee shall monitor the stream flow of the Beaver Dam River at the Beaver Dam USGS gauging station (#05425912) during the term of this permit at Sampling Point 601. This monitoring is required to determine the appropriate effluent limitations.

2 Land Application Requirements

2.1 Sampling Point(s)

The discharge(s) shall be limited to land application of the waste type(s) designated for the listed sampling point(s) on Department approved land spreading sites or by hauling to another facility.

Sampling Point Designation	
Sampling Point Number	**Sampling Point Location, WasteType/Sample Contents and Treatment Description (as applicable)**
002	Anaerobically digested, Thickened liquid, Class B. Representative sludge samples shall be collected after the secondary digester.
003	Anaerobically digested, Belt pressed cake, Class B. Representative sludge samples shall be collected from the sludge storage building.

2.2 Monitoring Requirements and Limitations

The permittee shall comply with the following monitoring requirements and limitations.

2.2.1 Sampling Point (Outfall) 002 - Liquid Sludge and 003- Cake SLUDGE

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
PCB Total Dry Wt	Ceiling	50 mg/kg	Once	Composite	Jan 1, 2015 - Dec 31, 2015
PCB Total Dry Wt	High Quality	10 mg/kg	Once	Composite	Jan 1, 2015 - Dec 31, 2015
Solids, Total		Percent	Annual	Composite	
Arsenic Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Arsenic Dry Wt	High Quality	41 mg/kg	Annual	Composite	
Cadmium Dry Wt	Ceiling	85 mg/kg	Annual	Composite	
Cadmium Dry Wt	High Quality	39 mg/kg	Annual	Composite	
Copper Dry Wt	Ceiling	4,300 mg/kg	Annual	Composite	
Copper Dry Wt	High Quality	1,500 mg/kg	Annual	Composite	
Lead Dry Wt	Ceiling	840 mg/kg	Annual	Composite	
Lead Dry Wt	High Quality	300 mg/kg	Annual	Composite	
Mercury Dry Wt	Ceiling	57 mg/kg	Annual	Composite	
Mercury Dry Wt	High Quality	17 mg/kg	Annual	Composite	
Molybdenum Dry Wt	Ceiling	75 mg/kg	Annual	Composite	
Nickel Dry Wt	Ceiling	420 mg/kg	Annual	Composite	
Nickel Dry Wt	High Quality	420 mg/kg	Annual	Composite	
Selenium Dry Wt	Ceiling	100 mg/kg	Annual	Composite	
Selenium Dry Wt	High Quality	100 mg/kg	Annual	Composite	
Zinc Dry Wt	Ceiling	7,500 mg/kg	Annual	Composite	
Zinc Dry Wt	High Quality	2,800 mg/kg	Annual	Composite	
Nitrogen, Total Kjeldahl		Percent	Annual	Composite	

Monitoring Requirements and Limitations					
Parameter	**Limit Type**	**Limit and Units**	**Sample Frequency**	**Sample Type**	**Notes**
Nitrogen, Ammonium (NH_4-N) Total		Percent	Annual	Composite	
Phosphorus, Total		Percent	Annual	Composite	
Phosphorus, Water Extractable		Percent	Annual	Composite	
Potassium, Total Recoverable		Percent	Annual	Composite	

Other Sludge Requirements	
Sludge Requirements	**Sample Frequency**
List 3 Requirements – Pathogen Control: The requirements in List 3 shall be met prior to land application of sludge.	**Annual**
List 4 Requirements – Vector Attraction Reduction: The vector attraction reduction shall be satisfied prior to, or at the time of land application as specified in List 4.	**Annual**

2.2.1.1 List 2 Analysis

If the monitoring frequency for List 2 parameters is more frequent than "Annual" then the sludge may be analyzed for the List 2 parameters just prior to each land application season rather than at the more frequent interval specified.

2.2.1.2 Changes in Feed Sludge Characteristics

If a change in feed sludge characteristics, treatment process, or operational procedures occurs which may result in a significant shift in sludge characteristics, the permittee shall reanalyze the sludge for List 1, 2, 3 and 4 parameters each time such change occurs.

2.2.1.3 Multiple Sludge Sample Points (Outfalls)

If there are multiple sludge sample points (outfalls), but the sludges are not subject to different sludge treatment processes, then a separate List 2 analysis shall be conducted for each sludge type which is land applied, just prior to land application, and the application rate shall be calculated for each sludge type. In this case, List 1, 3, and 4 and PCBs need only be analyzed on a single sludge type, at the specified frequency. If there are multiple sludge sample points (outfalls), due to multiple treatment processes, List 1, 2, 3 and 4 and PCBs shall be analyzed for each sludge type at the specified frequency.

2.2.1.4 Sludge Which Exceeds the High Quality Limit

Cumulative pollutant loading records shall be kept for all bulk land application of sludge which does not meet the high quality limit for any parameter. This requirement applies for the entire calendar year in which any exceedance of Table 3 of s. NR 204.07(5)(c), is experienced. Such loading records shall be kept for all List 1 parameters for each site land applied in that calendar year. The formula to be used for calculating cumulative loading is as follows:

[(Pollutant concentration (mg/kg) x dry tons applied/ac) ÷ 500] + previous loading (lbs/acre) = cumulative lbs pollutant per acre

When a site reaches 90% of the allowable cumulative loading for any metal established in Table 2 of s. NR 204.07(5)(b), the Department shall be so notified through letter or in the comment section of the annual land application report (3400-55).

2.2.1.5 Sludge Analysis for PCBs

The permittee shall analyze the sludge for Total PCBs one time during **2015**. The results shall be reported as "PCB Total Dry Wt". Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with Table EM in s. NR 219.04, Wis. Adm. Code and the conditions specified in Standard Requirements of this permit. PCB results shall be submitted by January 31, following the specified year of analysis.

2.2.1.6 Lists 1, 2, 3, and 4

List 1 **TOTAL SOLIDS AND METALS** See the Monitoring Requirements and Limitations table above for monitoring frequency and limitations for the List 1 parameters
Solids, Total (percent)
Arsenic, mg/kg (dry weight)
Cadmium, mg/kg (dry weight)
Copper, mg/kg (dry weight)
Lead, mg/kg (dry weight)
Mercury, mg/kg (dry weight)
Molybdenum, mg/kg (dry weight)
Nickel, mg/kg (dry weight)
Selenium, mg/kg (dry weight)
Zinc, mg/kg (dry weight)

List 2 **NUTRIENTS** See the Monitoring Requirements and Limitations table above for monitoring frequency for the List 2 parameters
Solids, Total (percent)
Nitrogen Total Kjeldahl (percent)
Nitrogen Ammonium (NH4-N) Total (percent)
Phosphorus Total as P (percent)
Phosphorus, Water Extractable (as percent of Total P)
Potassium Total Recoverable (percent)

List 3
PATHOGEN CONTROL FOR CLASS B SLUDGE

The permittee shall implement pathogen control as listed in List 3. The Department shall be notified of the pathogen control utilized and shall be notified when the permittee decides to utilize alternative pathogen control.

The following requirements shall be met prior to land application of sludge.

Parameter	Unit	Limit
Fecal Coliform*	MPN/gTS or CFU/gTS	2,000,000
OR, ONE OF THE FOLLOWING PROCESS OPTIONS		
Aerobic Digestion	Air Drying	
Anaerobic Digestion	Composting	
Alkaline Stabilization	PSRP Equivalent Process	

***** The Fecal Coliform limit shall be reported as the geometric mean of 7 discrete samples on a dry weight basis.

List 4
VECTOR ATTRACTION REDUCTION

The permittee shall implement any one of the vector attraction reduction options specified in List 4. The Department shall be notified of the option utilized and shall be notified when the permittee decides to utilize an alternative option.

One of the following shall be satisfied prior to, or at the time of land application as specified in List 4.

Option	Limit	Where/When it Shall be Met
Volatile Solids Reduction	≥38%	Across the process
Specific Oxygen Uptake Rate	≤1.5 mg O_2/hr/g TS	On aerobic stabilized sludge
Anaerobic bench-scale test	<17 % VS reduction	On anaerobic digested sludge
Aerobic bench-scale test	<15 % VS reduction	On aerobic digested sludge
Aerobic Process	>14 days, Temp >40°C and Avg. Temp > 45°C	On composted sludge
pH adjustment	>12 S.U. (for 2 hours) and >11.5 (for an additional 22 hours)	During the process
Drying without primary solids	>75 % TS	When applied or bagged
Drying with primary solids	>90 % TS	When applied or bagged
Equivalent Process	Approved by the Department	Varies with process
Injection	-	When applied
Incorporation	-	Within 6 hours of application

2.2.1.7 Daily Land Application Log

Daily Land Application Log		
Discharge Monitoring Requirements and Limitations The permittee shall maintain a daily land application log for biosolids land applied each day when land application occurs. The following minimum records must be kept, in addition to all analytical results for the biosolids land applied. The log book records shall form the basis for the annual land application report requirements**.**		
Parameters	**Units**	**Sample Frequency**
DNR Site Number(s)	Number	Daily as used
Outfall number applied	Number	Daily as used
Acres applied	Acres	Daily as used
Amount applied	As appropriate * /day	Daily as used
Application rate per acre	unit */acre	Daily as used
Nitrogen applied per acre	lb/acre	Daily as used
Method of Application	Injection, Incorporation, or surface applied	Daily as used

*gallons, cubic yards, dry US Tons or dry Metric Tons

3 Schedules

3.1 Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus

Required Action	Due Date
Operational Evaluation Report: The permittee shall prepare and submit to the Department for approval an operational evaluation report. The report shall include an evaluation of collected effluent data, possible source reduction measures, operational improvements or other minor facility modifications that will optimize reductions in phosphorus discharges from the treatment plant during the period prior to complying with final phosphorus WQBELs and, where possible, enable compliance with final phosphorus WQBELs by March 31, 2019. The report shall provide a plan and schedule for implementation of the measures, improvements, and modifications as soon as possible, but not later than March 31, 2019 and state whether the measures, improvements, and modifications will enable compliance with final phosphorus WQBELs. Regardless of whether they are expected to result in compliance, the permittee shall implement the measures, improvements, and modifications in accordance with the plan and schedule specified in the operational evaluation report. If the operational evaluation report concludes that the facility can achieve final phosphorus WQBELs using the existing treatment system with only source reduction measures, operational improvements, and minor facility modifications, the permittee shall comply with the final phosphorus WQBEL by March 31, 2017 and is not required to comply with the milestones identified below for years 3 through 9 of this compliance schedule ('Preliminary Compliance Alternatives Plan', 'Final Compliance Alternatives Plan', 'Final Plans and Specifications', 'Treatment Plant Upgrade to Meet WQBELs', 'Complete Construction', 'Achieve Compliance'). STUDY OF FEASIBLE ALTERNATIVES - If the Operational Evaluation Report concludes that the permittee cannot achieve final phosphorus WQBELs with source reduction measures, operational improvements and other minor facility modifications, the permittee shall initiate a study of feasible alternatives for meeting final phosphorus WQBELs and comply with the remaining required actions of this schedule of compliance. If the Department disagrees with the conclusion of the report, and determines that the permittee can achieve final phosphorus WQBELs using the existing treatment system with only source reduction measures, operational improvements, and minor facility modifications, the Department may reopen and modify the permit to include an implementation schedule for achieving the final phosphorus WQBELs sooner than July 1, 2023.	04/30/2018
Preliminary Compliance Alternatives Plan: The permittee shall submit a preliminary compliance alternatives plan to the Department. If the plan concludes upgrading of the permittee's wastewater treatment facility is necessary to achieve final phosphorus WQBELs, the submittal shall include a preliminary engineering design report. If the plan concludes Adaptive Management will be used, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 without the Adaptive Management Plan. If water quality trading will be undertaken, the plan must state that trading will be pursued.	09/30/2018
Final Compliance Alternatives Plan: The permittee shall submit a final compliance alternatives plan to the Department. If the plan concludes upgrading of the permittee's wastewater treatment is necessary to meet final phosphorus WQBELs, the submittal shall include a final engineering design report addressing the	03/31/2019

treatment plant upgrades, and a facility plan if required pursuant to ch. NR 110, Wis. Adm. Code. If the plan concludes Adaptive Management will be implemented, the submittal shall include a completed Watershed Adaptive Management Request Form 3200-139 and an engineering report addressing any treatment system upgrades necessary to meet interim limits pursuant to s. NR 217.18, Wis. Adm. Code. If the plan concludes water quality trading will be used, the submittal shall identify potential trading partners. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	
Progress Report on Plans & Specifications: Submit progress report regarding the progress of preparing final plans and specifications. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	12/31/2019
Final Plans and Specifications: Unless the permit has been modified, revoked and reissued, or reissued to include Adaptive Management or Water Quality Trading measures or to include a revised schedule based on factors in s. NR 217.17, Wis. Adm. Code, the permittee shall submit final construction plans to the Department for approval pursuant to s. 281.41, Stats., specifying treatment plant upgrades that must be constructed to achieve compliance with final phosphorus WQBELs, and a schedule for completing construction of the upgrades by the complete construction date specified below. (Note: Permit modification, revocation and reissuance, and reissuance are subject to s. 283.53(2), Stats.) Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	12/31/2020
Treatment Plant Upgrade to Meet WQBELs: The permittee shall initiate construction of the upgrades. The permittee shall obtain approval of the final construction plans and schedule from the Department pursuant to s. 281.41. Stats. Upon approval of the final construction plans and schedule by the Department pursuant to s. 281.41, Stats., the permittee shall construct the treatment plant upgrades in accordance with the approved plans and specifications. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	09/30/2021
Construction Upgrade Progress Report #1: The permittee shall submit a progress report on construction upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	03/31/2022
Construction Upgrade Progress Report #2: The permittee shall submit a progress report on construction upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	12/31/2022
Complete Construction: The permittee shall complete construction of wastewater treatment system upgrades. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	06/30/2023
Achieve Compliance: The permittee shall achieve compliance with final phosphorus WQBELs. Note: See 'Alternative Approaches to Phosphorus WQBEL Compliance' in the Surface Water section of this permit.	07/01/2023

3.2 Pretreatment Program Development

Required Action	Due Date
Pretreatment Program Development: Pursuant to s. NR 211.20, Wis. Adm. Code, and 40 CFR 403.8(a), federal General Pretreatment Regulations, the permittee is required to develop a pretreatment program and submit the required program elements to the Department for review. The permittee shall submit in draft form 1) an Industrial User Survey, 2) local limits and related limit development information, 3) a Sewer Use Ordinance, 4) inspection and sampling procedures, 5) an Enforcement Response Plan, 6) documentation on program organization, staffing, and equipment, 7) program costs/funding mechanisms, 8) program implementation procedures, and 9) a program summary document. The submitted program shall meet the requirements of ss. NR 211.22-211.26, Wis. Adm. Code and corresponding federal regulations. Program submittal is required by the Date Due. Additional Required Actions: Within 4 months of receiving Department comments regarding the initial program submittal the permittee shall submit a final request for pretreatment program approval that complies with s. NR 211.24, Wis. Adm. Code and includes in final form 1) a letter requesting program approval, 2) an adopted Sewer Use Ordinance, 3) a statement of legal authority, 4) a resolution to carry out the program, 5) an Enforcement Response Plan, Program Implementation Procedures, and Program Summary Document, and 6) program forms.	06/30/2015

4 Standard Requirements

NR 205, Wisconsin Administrative Code: The conditions in ss. NR 205.07(1) and NR 205.07(2), Wis. Adm. Code, are included by reference in this permit. The permittee shall comply with all of these requirements. Some of these requirements are outlined in the Standard Requirements section of this permit. Requirements not specifically outlined in the Standard Requirement section of this permit can be found in ss. NR 205.07(1) and NR 205.07(2).

4.1 Reporting and Monitoring Requirements

4.1.1 Monitoring Results

Monitoring results obtained during the previous month shall be summarized and reported on a Department Wastewater Discharge Monitoring Report. The report may require reporting of any or all of the information specified below under 'Recording of Results'. This report is to be returned to the Department no later than the date indicated on the form. A copy of the Wastewater Discharge Monitoring Report Form or an electronic file of the report shall be retained by the permittee.

Monitoring results shall be reported on an electronic discharge monitoring report (eDMR). The eDMR shall be certified electronically by a principal executive officer, a ranking elected official or other duly authorized representative. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

If the permittee monitors any pollutant more frequently than required by this permit, the results of such monitoring shall be included on the Wastewater Discharge Monitoring Report.

The permittee shall comply with all limits for each parameter regardless of monitoring frequency. For example, monthly, weekly, and/or daily limits shall be met even with monthly monitoring. The permittee may monitor more frequently than required for any parameter.

4.1.2 Sampling and Testing Procedures

Sampling and laboratory testing procedures shall be performed in accordance with Chapters NR 218 and NR 219, Wis. Adm. Code and shall be performed by a laboratory certified or registered in accordance with the requirements of ch. NR 149, Wis. Adm. Code. Groundwater sample collection and analysis shall be performed in accordance with ch. NR 140, Wis. Adm. Code. The analytical methodologies used shall enable the laboratory to quantitate all substances for which monitoring is required at levels below the effluent limitation. If the required level cannot be met by any of the methods available in NR 219, Wis. Adm. Code, then the method with the lowest limit of detection shall be selected. Additional test procedures may be specified in this permit.

4.1.3 Pretreatment Sampling Requirements

Sampling for pretreatment parameters (cadmium, chromium, copper, lead, nickel, zinc, and mercury) shall be done during a day each month when industrial discharges are occurring at normal to maximum levels. The sampling of the influent and effluent for these parameters shall be coordinated. All 24 hour composite samples shall be flow proportional.

4.1.4 Recording of Results

The permittee shall maintain records which provide the following information for each effluent measurement or sample taken:

- the date, exact place, method and time of sampling or measurements;
- the individual who performed the sampling or measurements;
- the date the analysis was performed;
- the individual who performed the analysis;

- the analytical techniques or methods used; and
- the results of the analysis.

4.1.5 Reporting of Monitoring Results

The permittee shall use the following conventions when reporting effluent monitoring results:

- Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 0.1 mg/L, report the pollutant concentration as < 0.1 mg/L.

- Pollutant concentrations equal to or greater than the limit of detection, but less than the limit of quantitation, shall be reported and the limit of quantitation shall be specified.

- For purposes of calculating NR 101 fees, the 2 mg/l lower reporting limits for BOD_5 and Total Suspended Solids shall be considered to be limits of quantitation

- For the purposes of reporting a calculated result, average or a mass discharge value, the permittee may substitute a 0 (zero) for any pollutant concentration that is less than the limit of detection. However, if the effluent limitation is less than the limit of detection, the department may substitute a value other than zero for results less than the limit of detection, after considering the number of monitoring results that are greater than the limit of detection and if warranted when applying appropriate statistical techniques.

4.1.6 Compliance Maintenance Annual Reports

Compliance Maintenance Annual Reports (CMAR) shall be completed using information obtained over each calendar year regarding the wastewater conveyance and treatment system. The CMAR shall be submitted by the permittee in accordance with ch. NR 208, Wis. Adm. Code, by June 30, each year on an electronic report form provided by the Department.

In the case of a publicly owned treatment works, a resolution shall be passed by the governing body and submitted as part of the CMAR, verifying its review of the report and providing responses as required. Private owners of wastewater treatment works are not required to pass a resolution; but they must provide an Owner Statement and responses as required, as part of the CMAR submittal.

A separate CMAR certification document, that is not part of the electronic report form, shall be mailed to the Department at the time of electronic submittal of the CMAR. The CMAR certification shall be signed and submitted by an authorized representative of the permittee. The certification shall be submitted by mail. The certification shall verify the electronic report is complete, accurate and contains information from the owner's treatment works.

4.1.7 Records Retention

The permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by the permit, and records of all data used to complete the application for the permit for a period of at least 3 years from the date of the sample, measurement, report or application. All pertinent sludge information, including permit application information and other documents specified in this permit or s. NR 204.06(9), Wis. Adm. Code shall be retained for a minimum of 5 years.

4.1.8 Other Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application or submitted incorrect information in a permit application or in any report to the Department, it shall promptly submit such facts or correct information to the Department.

4.2 System Operating Requirements

4.2.1 Noncompliance Reporting

Sanitary sewer overflows and sewage treatment facility overflows shall be reported according to the 'Sanitary Sewer Overflows and Sewage Treatment Facility Overflows' section of this permit.

The permittee shall report the following types of noncompliance by a telephone call to the Department's regional office within 24 hours after becoming aware of the noncompliance:

- any noncompliance which may endanger health or the environment;
- any violation of an effluent limitation resulting from an unscheduled bypass;
- any violation of an effluent limitation resulting from an upset; and
- any violation of a maximum discharge limitation for any of the pollutants listed by the Department in the permit, either for effluent or sludge.

A written report describing the noncompliance shall also be submitted to the Department's regional office within 5 days after the permittee becomes aware of the noncompliance. On a case-by-case basis, the Department may waive the requirement for submittal of a written report within 5 days and instruct the permittee to submit the written report with the next regularly scheduled monitoring report. In either case, the written report shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times; the steps taken or planned to reduce, eliminate and prevent reoccurrence of the noncompliance; and if the noncompliance has not been corrected, the length of time it is expected to continue.

A scheduled bypass approved by the Department under the 'Scheduled Bypass' section of this permit shall not be subject to the reporting required under this section.

NOTE: Section 292.11(2)(a), Wisconsin Statutes, requires any person who possesses or controls a hazardous substance or who causes the discharge of a hazardous substance to notify the Department of Natural Resources **immediately** of any discharge not authorized by the permit. **The discharge of a hazardous substance that is not authorized by this permit or that violates this permit may be a hazardous substance spill**. **To report a hazardous substance spill, call DNR's 24-hour HOTLINE at 1-800-943-0003.**

4.2.2 Flow Meters

Flow meters shall be calibrated annually, as per s. NR 218.06, Wis. Adm. Code.

4.2.3 Raw Grit and Screenings

All raw grit and screenings shall be disposed of at a properly licensed solid waste facility or picked up by a licensed waste hauler. If the facility or hauler are located in Wisconsin, then they shall be licensed under chs. NR 500-536, Wis. Adm. Code.

4.2.4 Sludge Management

All sludge management activities shall be conducted in compliance with ch. NR 204 "Domestic Sewage Sludge Management", Wis. Adm. Code.

4.2.5 Prohibited Wastes

Under no circumstances may the introduction of wastes prohibited by s. NR 211.10, Wis. Adm. Code, be allowed into the waste treatment system. Prohibited wastes include those:

- which create a fire or explosion hazard in the treatment work;
- which will cause corrosive structural damage to the treatment work;
- solid or viscous substances in amounts which cause obstructions to the flow in sewers or interference with the proper operation of the treatment work;
- wastewaters at a flow rate or pollutant loading which are excessive over relatively short time periods so as to cause a loss of treatment efficiency; and
- changes in discharge volume or composition from contributing industries which overload the treatment works or cause a loss of treatment efficiency.

4.2.6 Bypass

This condition applies only to bypassing at a sewage treatment facility that is not a scheduled bypass, approved blending as a specific condition of this permit, a sewage treatment facility overflow or a controlled diversion as provided in the sections titled 'Scheduled Bypass', 'Blending' (if approved), 'SSO's and Sewage Treatment Facility Overflows' and 'Controlled Diversions' of this permit. Any other bypass at the sewage treatment facility is prohibited and the Department may take enforcement action against a permittee for such occurrences under s. 283.89, Wis. Stats. The Department may approve an unscheduled bypass provided all the following conditions are met:

- The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
- There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities or adequate back-up equipment, retention of untreated wastes, reduction of inflow and infiltration, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance. When evaluating feasibility of alternatives, the department may consider factors such as technical achievability, costs and affordability of implementation and risks to public health, the environment and, where the permittee is a municipality, the welfare of the community served; and
- The bypass was reported in accordance with the Noncompliance Reporting section of this permit.

4.2.7 Scheduled Bypass

Whenever the permittee anticipates the need to bypass for purposes of efficient operations and maintenance and the permittee may not meet the conditions for controlled diversions in the 'Controlled Diversions' section of this permit, the permittee shall obtain prior written approval from the Department for the scheduled bypass. A permittee's written request for Department approval of a scheduled bypass shall demonstrate that the conditions for unscheduled bypassing are met and include the proposed date and reason for the bypass, estimated volume and duration of the bypass, alternatives to bypassing and measures to mitigate environmental harm caused by the bypass. The department may require the permittee to provide public notification for a scheduled bypass if it is determined there is significant public interest in the proposed action and may recommend mitigation measures to minimize the impact of such bypass.

4.2.8 Controlled Diversions

Controlled diversions are allowed only when necessary for essential maintenance to assure efficient operation. Sewage treatment facilities that have multiple treatment units to treat variable or seasonal loading conditions may shut down redundant treatment units when necessary for efficient operation. The following requirements shall be met during controlled diversions:

- Effluent from the sewage treatment facility shall meet the effluent limitations established in the permit. Wastewater that is diverted around a treatment unit or treatment process during a controlled diversion shall be recombined with wastewater that is not diverted prior to the effluent sampling location and prior to effluent discharge;
- A controlled diversion may not occur during periods of excessive flow or other abnormal wastewater characteristics;
- A controlled diversion may not result in a wastewater treatment facility overflow; and
- All instances of controlled diversions shall be documented in sewage treatment facility records and such records shall be available to the department on request.

4.2.9 Blending

The Department has determined that blending may occur at this sewage treatment facility. The following requirements shall apply whenever blending operations are in effect:

- Blending may occur temporarily only during wet weather or other high flow conditions when peak wastewater flow to the sewage treatment facility exceeds the maximum design and operating capacity of the biological treatment processes and when necessary to avoid severe property damage to the sewage treatment facility as described in NR 210.12 (2) (a), Wis. Adm. Code.;
- Untreated, or partially treated wastewater that is routed around the biological treatment process, or a portion of a biological treatment process, shall be recombined with the biologically treated wastewater and the combined flow shall be disinfected, if required by this permit, prior to discharge;
- Effluent from the sewage treatment facility shall be monitored to include all wastewater that is discharged from the facility, including those wastewaters that are diverted around the biological treatment process and shall meet the effluent limitations for Outfall 001 included in this permit; and
- Blending under this section and the circumstances that lead to blending shall be reported to the Department by telephone, fax or email no later than 24 hours from the time each blending operation ceases at the sewage treatment facility. Permittees shall also report the time, duration and volume of wastewater routed around the biological treatment process on the wastewater Discharge Monitoring Report (DMR) forms.

4.2.10 Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of this permit. The wastewater treatment facility shall be under the direct supervision of a state certified operator as required in s. NR 108.06(2), Wis. Adm. Code. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training as required in ch. NR 114, Wis. Adm. Code, and adequate laboratory and process controls, including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit.

4.3 Sewage Collection Systems

4.3.1 Sanitary Sewage Overflows and Sewage Treatment Facility Overflows

4.3.1.1 Overflows Prohibited

Any overflow or discharge of wastewater from the sewage collection system or at the sewage treatment facility, other than from permitted outfalls, is prohibited. The permittee shall provide information on whether any of the following conditions existed when an overflow occurred:

- The sanitary sewer overflow or sewage treatment facility overflow was unavoidable to prevent loss of life, personal injury or severe property damage;

- There were no feasible alternatives to the sanitary sewer overflow or sewage treatment facility overflow such as the use of auxiliary treatment facilities or adequate back-up equipment, retention of untreated wastes, reduction of inflow and infiltration, or preventative maintenance activities;
- The sanitary sewer overflow or the sewage treatment facility overflow was caused by unusual or severe weather related conditions such as large or successive precipitation events, snowmelt, saturated soil conditions, or severe weather occurring in the area served by the sewage collection system or sewage treatment facility; and
- The sanitary sewer overflow or the sewage treatment facility overflow was unintentional, temporary, and caused by an accident or other factors beyond the reasonable control of the permittee.

4.3.1.2 Permittee Response to Overflows

Whenever a sanitary sewer overflow or sewage treatment facility overflow occurs, the permittee shall take all feasible steps to control or limit the volume of untreated or partially treated wastewater discharged, and terminate the discharge as soon as practicable. Remedial actions, including those in NR 210.21 (3), Wis. Adm. Code, shall be implemented consistent with an emergency response plan developed under the CMOM program.

4.3.1.3 Permittee Reporting

Permittees shall report all sanitary sewer overflows and sewage treatment overflows as follows:

- The permittee shall notify the department by telephone, fax or email as soon as practicable, but no later than 24 hours from the time the permittee becomes aware of the overflow;
- The permittee shall, no later than five days from the time the permittee becomes aware of the overflow, provide to the department the information identified in this paragraph using department form number 3400-184. If an overflow lasts for more than five days, an initial report shall be submitted within 5 days as required in this paragraph and an updated report submitted following cessation of the overflow. At a minimum, the following information shall be included in the report:

  ◦The date and location of the overflow;
  ◦The surface water to which the discharge occurred, if any;
  ◦The duration of the overflow and an estimate of the volume of the overflow;
  ◦A description of the sewer system or treatment facility component from which the discharge occurred such as manhole, lift station, constructed overflow pipe, or crack or other opening in a pipe;
  ◦The estimated date and time when the overflow began and stopped or will be stopped;
  ◦The cause or suspected cause of the overflow including, if appropriate, precipitation, runoff conditions, areas of flooding, soil moisture and other relevant information;
  ◦Steps taken or planned to reduce, eliminate and prevent reoccurrence of the overflow and a schedule of major milestones for those steps;
  ◦A description of the actual or potential for human exposure and contact with the wastewater from the overflow;
  ◦Steps taken or planned to mitigate the impacts of the overflow and a schedule of major milestones for those steps;
  ◦To the extent known at the time of reporting, the number and location of building backups caused by excessive flow or other hydraulic constraints in the sewage collection system that occurred concurrently with the sanitary sewer overflow and that were within the same area of the sewage collection system as the sanitary sewer overflow; and
  ◦The reason the overflow occurred or explanation of other contributing circumstances that resulted in the overflow event. This includes any information available including whether the overflow was unavoidable to prevent loss of life, personal injury, or severe property damage and whether there were feasible alternatives to the overflow.

NOTE: A copy of form 3400-184 for reporting sanitary sewer overflows and sewage treatment facility overflows may be obtained from the department or accessed on the department's web site at http://dnr.wi.gov/topic/wastewater/SSOreport.html. As indicated on the form, additional information may be submitted to supplement the information required by the form.

- The permittee shall identify each specific location and each day on which a sanitary sewer overflow or sewage treatment facility overflow occurs as a discrete sanitary sewer overflow or sewage treatment facility overflow occurrence. An occurrence may be more than one day if the circumstances causing the sanitary sewer overflow or sewage treatment facility overflow results in a discharge duration of greater than 24 hours. If there is a stop and restart of the overflow at the same location within 24 hours and the overflow is caused by the same circumstance, it may be reported as one occurrence. Sanitary sewer overflow occurrences at a specific location that are separated by more than 24 hours shall be reported as separate occurrences; and
- A permittee that is required to submit wastewater discharge monitoring reports under NR 205.07 (1) (r) shall also report all sanitary sewer overflows and sewage treatment facility overflows on that report.

4.3.1.4 Public Notification

The permittee shall notify the public of any sanitary sewer and sewage treatment facility overflows consistent with its emergency response plan required under the CMOM (Capacity, Management, Operation and Maintenance) section of this permit and s. NR 210.23 (4) (f), Wis. Adm. Code. Such public notification shall occur promptly following any overflow event using the most effective and efficient communications available in the community. At minimum, a daily newspaper of general circulation in the county(s) and municipality whose waters may be affected by the overflow shall be notified by written or electronic communication.

4.3.2 Capacity, Management, Operation and Maintenance (CMOM) Program

- The permittee shall by August 1, 2016 submit to the Department verification that a CMOM program for the sewage collection system has been developed which is consistent with the requirements of NR 210.23, Wis. Adm. Code.
- The permittee shall develop and maintain written documentation of the CMOM program components, and shall verify each year with the submittal of the Compliance Maintenance Annual Report required under the 'Compliance Maintenance Annual Reports' section of this permit that the CMOM program documentation is current and meets the requirements in NR 210.23, Wis. Adm. Code.
- The permittee shall implement a CMOM program consistent with the permittee's program documentation and with the requirements of NR 210.23, Wis. Adm. Code.
- The permittee shall annually conduct a self-audit of activities to ensure the CMOM program is being implemented as necessary to meet the requirements contained in the CMOM program documentation.
- The permittee shall make available CMOM program documentation, a record of implementation activities and the results of the self-audit to the Department on request.

4.3.3 Sewer Cleaning Debris and Materials

All debris and material removed from cleaning sanitary sewers shall be managed to prevent nuisances, run-off, ground infiltration or prohibited discharges.

- Debris and solid waste shall be dewatered, dried and then disposed of at a licensed solid waste facility.
- Liquid waste from the cleaning and dewatering operations shall be collected and disposed of at a permitted wastewater treatment facility.
- Combination waste including liquid waste along with debris and solid waste may be disposed of at a licensed solid waste facility or wastewater treatment facility willing to accept the waste.

4.4 Surface Water Requirements

4.4.1 Permittee-Determined Limit of Quantitation Incorporated into this Permit

For pollutants with water quality-based effluent limits below the Limit of Quantitation (LOQ) in this permit, the LOQ calculated by the permittee and reported on the Discharge Monitoring Reports (DMRs) is incorporated by reference into this permit. The LOQ shall be reported on the DMRs, shall be the lowest quantifiable level practicable, and shall be no greater than the minimum level (ML) specified in or approved under 40 CFR Part 136 for the pollutant at the time this permit was issued, unless this permit specifies a higher LOQ.

4.4.2 Appropriate Formulas for Effluent Calculations

The permittee shall use the following formulas for calculating effluent results to determine compliance with average concentration limits and mass limits and total load limits:

Weekly/Monthly/Six-Month/Annual Average Concentration = the sum of all daily results for that week/month/six-month/year, divided by the number of results during that time period. [Note: When a six-month average effluent limit is specified for Total Phosphorus the applicable periods are May through October and November through April.]

Weekly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the week.

Monthly Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the month.

Six-Month Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the six-month period. [Note: When a six-month average effluent limit is specified for Total Phosphorus the applicable periods are May through October and November through April.]

Annual Average Mass Discharge (lbs/day): Daily mass = daily concentration (mg/L) x daily flow (MGD) x 8.34, then average the daily mass values for the entire year.

Total Monthly Discharge: = monthly average concentration (mg/L) x total flow for the month (MG/month) x 8.34.

Total Annual Discharge: = sum of total monthly discharges for the calendar year.

12-Month Rolling Sum of Total Monthly Discharge: = the sum of the most recent 12 consecutive months of Total Monthly Discharges.

4.4.3 Effluent Temperature Requirements

Weekly Average Temperature – The permittee shall use the following formula for calculating effluent results to determine compliance with the weekly average temperature limit (as applicable): Weekly Average Temperature = the sum of all daily maximum results for that week divided by the number of daily maximum results during that time period.

Cold Shock Standard – Water temperatures of the discharge shall be controlled in a manner as to protect fish and aquatic life uses from the deleterious effects of cold shock. 'Cold Shock' means exposure of aquatic organisms to a rapid decrease in temperature and a sustained exposure to low temperature that induces abnormal behavior or physiological performance and may lead to death.

Rate of Temperature Change Standard – Temperature of a water of the state or discharge to a water of the state may not be artificially raised or lowered at such a rate that it causes detrimental health or reproductive effects to fish or aquatic life of the water of the state.

4.4.4 Visible Foam or Floating Solids

There shall be no discharge of floating solids or visible foam in other than trace amounts.

4.4.5 Surface Water Uses and Criteria

In accordance with NR 102.04, Wis. Adm. Code, surface water uses and criteria are established to govern water management decisions. Practices attributable to municipal, industrial, commercial, domestic, agricultural, land development or other activities shall be controlled so that all surface waters including the mixing zone meet the following conditions at all times and under all flow and water level conditions:

a) Substances that will cause objectionable deposits on the shore or in the bed of a body of water, shall not be present in such amounts as to interfere with public rights in waters of the state.

b) Floating or submerged debris, oil, scum or other material shall not be present in such amounts as to interfere with public rights in waters of the state.

c) Materials producing color, odor, taste or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the state.

d) Substances in concentrations or in combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant or aquatic life.

4.4.6 Percent Removal

During any 30 consecutive days, the average effluent concentrations of BOD_5 and of total suspended solids shall not exceed 15% of the average influent concentrations, respectively. This requirement does not apply to removal of total suspended solids if the permittee operates a lagoon system and has received a variance for suspended solids granted under NR 210.07(2), Wis. Adm. Code.

4.4.7 Fecal Coliforms

The limit for fecal coliforms shall be expressed as a monthly geometric mean.

4.4.8 Seasonal Disinfection

Disinfection shall be provided from May 1 through September 30 of each year. Monitoring requirements and the limitation for fecal coliforms apply only during the period in which disinfection is required. Whenever chlorine is used for disinfection or other uses, the limitations and monitoring requirements for residual chlorine shall apply. A dechlorination process shall be in operation whenever chlorine is used.

4.4.9 Applicability of Alternative Wet Weather Mass Limitations

- An alternative wet weather mass limitation applies when:
  - The applicable mass limitation (based on annual average design flow) is exceeded; and
  - The permittee demonstrates to the satisfaction of the Department that the discharge exceedance is caused by and occurs during a wet weather event. For the purposes of this demonstration, a wet weather event occurs during and immediately following periods of precipitation or snowmelt, including but not limited to rain, sleet, snow, hail or melting snow during which water from the precipitation, snowmelt or elevated groundwater enters the sewerage system through infiltration or inflow, or both. The permittee shall present demonstrations to the Department by attaching them to the Wastewater Discharge Monitoring Report Form(s).

Note: In making this demonstration, the permittee may want to consider presenting a discussion of normal effluent flow rates, the effluent flow rates that resulted in the exceedance and identification of the event, including intensity and duration, which caused the high flow rates. A graph of effluent flow over time may also be helpful.

4.4.10 Total Residual Chlorine Requirements (When De-Chlorinating Effluent)

Test methods for total residual chlorine, approved in ch. NR 219 - Table B, Wis. Adm. Code, normally achieve a limit of detection of about 20 to 50 micrograms per liter and a limit of quantitation of about 100 micrograms per liter. Reporting of test results and compliance with effluent limitations for chlorine residual and total residual halogens shall be as follows:

- Sample results which show no detectable levels are in compliance with the limit. These test results shall be reported on Wastewater Discharge Monitoring Report Forms as "< 100 µg/L". (Note: 0.1 mg/L converts to 100 µg/L)

- Samples showing detectable traces of chlorine are in compliance if measured at less than 100 µg/L, unless there is a consistent pattern of detectable values in this range. These values shall also be reported on Wastewater Discharge Monitoring Report Forms as "<100 µg/L." The facility operating staff shall record actual readings on logs maintained at the plant, shall take action to determine the reliability of detected results (such as re-sampling and/or calculating dosages), and shall adjust the chemical feed system if necessary to reduce the chances of detects.

- Samples showing detectable levels greater than 100 µg/L shall be considered as exceedances, and shall be reported as measured.

- To calculate average or mass discharge values, a "0" (zero) may be substituted for any test result less than 100 µg/L. Calculated values shall then be compared directly to the average or mass limitations to determine compliance.

4.4.11 Whole Effluent Toxicity (WET) Monitoring Requirements

In order to determine the potential impact of the discharge on aquatic organisms, static-renewal toxicity tests shall be performed on the effluent in accordance with the procedures specified in the *"State of Wisconsin Aquatic Life Toxicity Testing Methods Manual, 2nd Edition" (PUB-WT-797*, November 2004) as required by NR 219.04, Table A, Wis. Adm. Code). All of the WET tests required in this permit, including any required retests, shall be conducted on the *Ceriodaphnia dubia* and fathead minnow species. Receiving water samples shall not be collected from any point in contact with the permittee's mixing zone and every attempt shall be made to avoid contact with any other discharge's mixing zone.

4.4.12 Whole Effluent Toxicity (WET) Identification and Reduction

This standard requirement applies only to acute or chronic WET monitoring that is not accompanied by a WET limit. Within 60 days of a retest which showed positive results, the permittee shall submit a written report to the Biomonitoring Coordinator, Bureau of Water Quality, 101 S. Webster St., PO Box 7921, Madison, WI 53707-7921, which details the following:

- A description of actions the permittee has taken or will take to remove toxicity and to prevent the recurrence of toxicity;

- A description of toxicity reduction evaluation (TRE) investigations that have been or will be done to identify potential sources of toxicity, including some or all of the following actions:

(a) Evaluate the performance of the treatment system to identify deficiencies contributing to effluent toxicity (e.g., operational problems, chemical additives, incomplete treatment)

(b) Identify the compound(s) causing toxicity

(c) Trace the compound(s) causing toxicity to their sources (e.g., industrial, commercial, domestic)

(d) Evaluate, select, and implement methods or technologies to control effluent toxicity (e.g., in-plant or pretreatment controls, source reduction or removal)

- Where corrective actions including a TRE have not been completed, an expeditious schedule under which corrective actions will be implemented;

- If no actions have been taken, the reason for not taking action.

The permittee may also request approval from the Department to postpone additional retests in order to investigate the source(s) of toxicity. Postponed retests must be completed after toxicity is believed to have been removed.

4.5 Pretreatment Program Requirements

The permittee shall implement an industrial pretreatment program after it has received final approval from the Department of the required pretreatment program elements as described in 40 CFR Part 403.8 of the federal regulations and ch. NR 211, Wis. Adm. Code. When approval is received, the program shall be operated as initially described, including any subsequent program modifications approved by the Department, and including commitments to program implementation activities provided in the permittee's annual pretreatment program report, and that complies with the requirements set forth in 40 CFR Part 403 and ch. NR 211, Wis. Adm. Code. To ensure that the program is operated in accordance with these requirements, the following general conditions and requirements contained in the cited documents but not here enumerated, are hereby established and shall become effective upon final Department approval:

4.5.1 Inventories

The permittee shall implement methods to maintain a current inventory of the general character and volume of wastewater that industrial users discharge to the treatment works and shall provide an updated industrial user listing annually and report any changes in the listing to the Department by March 31 of each year as part of the annual pretreatment program report required herein.

4.5.2 Regulation of Industrial Users

4.5.2.1 Limitations for Industrial Users:

The permittee shall develop, maintain, enforce and revise as necessary local limits to implement the general and specific prohibitions of the state and federal General Pretreatment Regulations.

4.5.2.2 Control Documents for Industrial Users (IUs)

The permittee shall control the discharge from each significant industrial user through individual discharge permits as required by s. NR 211.235, Wis. Adm. Code and in accordance with the approved pretreatment program procedures and the permittee's sewer use ordinance. The discharge permits shall be modified in a timely manner during the stated term of the discharge permits according to the sewer use ordinance as conditions warrant. The discharge permits shall include at a minimum the elements found in s. NR 211.235(1), Wis. Adm. Code and references to the approved pretreatment program procedures and the sewer use ordinance.

The permittee shall provide a copy of all newly issued, reissued, or modified discharge permits to the Department.

4.5.2.3 Review of Industrial User Reports, Inspections and Compliance Monitoring

The permittee shall require the submission of, receive, and review self-monitoring reports and other notices from industrial users in accordance with the approved pretreatment program procedures. The permittee shall randomly sample and analyze industrial user discharges and conduct surveillance activities to determine independent of information supplied by the industrial users, whether the industrial users are in compliance with pretreatment standards and requirements. The inspections and monitoring shall also be conducted to maintain accurate knowledge of local industrial processes, including changes in the discharge, pretreatment equipment operation, spill prevention control plans, slug control plans, and implementation of solvent management plans.

At least one time per year the permittee shall inspect and sample the discharge from each significant industrial user, or more frequently if so specified in the permittee's approved pretreatment program. At least once every 2 years the permittee shall evaluate whether each significant industrial user needs a slug control plan. If a slug control plan is needed, the plan shall contain at a minimum the elements specified in s. NR 211.235(4)(b), Wis. Adm. Code.

4.5.2.4 Enforcement and Industrial User Compliance Evaluation & Violation Reports

The permittee shall enforce the industrial pretreatment requirements including the industrial user discharge limitations of the permittee's sewer use ordinance. The permittee shall investigate instances of noncompliance by collecting and analyzing samples and collecting other information with sufficient care to produce evidence admissible in enforcement proceedings or in judicial actions. Investigation and response to instances of noncompliance shall be in accordance with the permittee's sewer use ordinance and approved Enforcement Response Plan.

The permittee shall make a semiannual report on forms provided or approved by the Department. The semiannual report shall include an analysis of industrial user significant noncompliance (i.e. the Industrial User Compliance Evaluation, also known as the SNC Analysis) as outlined in s.NR 211.23(1)(j), Wis. Adm. Code, and a summary of the permittee's response to all industrial noncompliance (i.e. the Industrial User Violation Report). The Industrial User Compliance Evaluation Report shall include monitoring results received from industrial users pursuant to s. NR 211.15(1)-(5), Wis. Adm. Code. The Industrial User Violation Report shall include copies of all notices of noncompliance, notices of violation and other enforcement correspondence sent by the permittee to industrial users, together with the industrial user's response. The Industrial User Compliance Evaluation and Violation Reports for the period January through June shall be provided to the Department by September 30 of each year and for the period July through December shall be provided to the Department by March 31 of the succeeding year, unless alternate submittal dates are approved.

4.5.2.5 Publication of Violations

The permittee shall publish a list of industrial users that have significantly violated the municipal sewer use ordinance during the calendar year, in the largest daily newspaper in the area by March 31 of the following year pursuant to s. NR 211.23(1)(j), Wis. Adm. Code. A copy of the newspaper publication shall be provided as part of the annual pretreatment report specified herein.

4.5.2.6 Multijurisdictional Agreements

The permittee shall establish agreements with all contributing jurisdictions as necessary to ensure compliance with pretreatment standards and requirements by all industrial users discharging to the permittee's wastewater treatment system. Any such agreement shall identify who will be responsible for maintaining the industrial user inventory, issuance of industrial user control mechanisms, inspections and sampling, pretreatment program implementation, and enforcement.

4.5.3 Annual Pretreatment Program Report

The permittee shall evaluate the pretreatment program, and submit the Pretreatment Program Report to the Department on forms provided or approved by the Department by March 31 annually, unless an alternate submittal

date is approved. The report shall include a brief summary of the work performed during the preceding calendar year, including the numbers of discharge permits issued and in effect, pollution prevention activities, number of inspections and monitoring surveys conducted, budget and personnel assigned to the program, a general discussion of program progress in meeting the objectives of the permittee's pretreatment program together with summary comments and recommendations.

4.5.4 Pretreatment Program Modifications

- Future Modifications: The permittee shall within one year of any revisions to federal or state General Pretreatment Regulations submit an application to the Department in duplicate to modify and update its approved pretreatment program to incorporate such regulatory changes as applicable to the permittee. Additionally, the Department or the permittee may request an application for program modification at any time where necessary to improve program effectiveness based on program experience to date.

- Modifications Subject to Department Approval: The permittee shall submit all proposed pretreatment program modifications to the Department for determination of significance and opportunity for comment in accordance with the requirements and conditions of s. NR 211.27, Wis. Adm. Code. Any substantial proposed program modification shall be subject to Department public noticing and formal approval prior to implementation. A substantial program modification includes, but is not limited to, changes in enabling legal authority to administer and enforce pretreatment conditions and requirements; significant changes in program administrative or operational procedures; significant reductions in monitoring frequencies; significant reductions in program resources including personnel commitments, equipment, and funding levels; changes (including any relaxation) in the local limitations for substances enforced and applied to users of the sewerage treatment works; changes in treatment works sludge disposal or management practices which impact the pretreatment program; or program modifications which increase pollutant loadings to the treatment works. The Department shall use the procedures outlined in s. NR 211.30, Wis. Adm. Code for review and approval/denial of proposed pretreatment program modifications. The permittee shall comply with local public participation requirements when implementing the pretreatment program.

4.5.5 Program Resources

The permittee shall have sufficient resources and qualified personnel to carry out the pretreatment program responsibilities as listed in ss. NR 211.22 and NR 211.23, Wis. Adm. Code.

4.6 Land Application Requirements

4.6.1 Sludge Management Program Standards And Requirements Based Upon Federally Promulgated Regulations

In the event that new federal sludge standards or regulations are promulgated, the permittee shall comply with the new sludge requirements by the dates established in the regulations, if required by federal law, even if the permit has not yet been modified to incorporate the new federal regulations.

4.6.2 General Sludge Management Information

The General Sludge Management Form 3400-48 shall be completed and submitted prior to any significant sludge management changes.

4.6.3 Sludge Samples

All sludge samples shall be collected at a point and in a manner which will yield sample results which are representative of the sludge being tested, and collected at the time which is appropriate for the specific test.

4.6.4 Land Application Characteristic Report

Each report shall consist of a Characteristic Form 3400-49 and Lab Report. The Characteristic Report Form 3400-49 shall be submitted electronically by January 31 following each year of analysis.

Following submittal of the electronic Characteristic Report Form 3400-49, this form shall be certified electronically via the 'eReport Certify' page by a principal executive officer, ranking elected official or duly authorized representative. The 'eReport Certify' page certifies that the electronic report is true, accurate and complete. The Lab Report must be sent directly to the facility's DNR sludge representative or basin engineer unless approval for not submitting the lab reports has been given.

The permittee shall use the following convention when reporting sludge monitoring results: Pollutant concentrations less than the limit of detection shall be reported as < (less than) the value of the limit of detection. For example, if a substance is not detected at a detection limit of 1.0 mg/kg, report the pollutant concentration as < 1.0 mg/kg .

All results shall be reported on a dry weight basis.

4.6.5 Calculation of Water Extractable Phosphorus

When sludge analysis for Water Extractable Phosphorus is required by this permit, the permittee shall use the following formula to calculate and report Water Extractable Phosphorus:
Water Extractable Phosphorus (% of Total P) =
[Water Extractable Phosphorus (mg/kg, dry wt) ÷ Total Phosphorus (mg/kg, dry wt)] x 100

4.6.6 Monitoring and Calculating PCB Concentrations in Sludge

When sludge analysis for "PCB, Total Dry Wt" is required by this permit, the PCB concentration in the sludge shall be determined as follows.

Either congener-specific analysis or Aroclor analysis shall be used to determine the PCB concentration. The permittee may determine whether Aroclor or congener specific analysis is performed. Analyses shall be performed in accordance with the following provisions and Table EM in s. NR 219.04, Wis. Adm. Code.

- EPA Method 1668 may be used to test for all PCB congeners. If this method is employed, all PCB congeners shall be delineated. Non-detects shall be treated as zero. The values that are between the limit of detection and the limit of quantitation shall be used when calculating the total value of all congeners. All results shall be added together and the total PCB concentration by dry weight reported. **Note**: It is recognized that a number of the congeners will co-elute with others, so there will not be 209 results to sum.
- EPA Method 8082A shall be used for PCB-Aroclor analysis and may be used for congener specific analysis as well. If congener specific analysis is performed using Method 8082A, the list of congeners tested shall include at least congener numbers 5, 18, 31, 44, 52, 66, 87, 101, 110, 138, 141, 151, 153, 170, 180, 183, 187, and 206 plus any other additional congeners which might be reasonably expected to occur in the particular sample. For either type of analysis, the sample shall be extracted using the Soxhlet extraction (EPA Method 3540C) (or the Soxhlet Dean-Stark modification) or the pressurized fluid extraction (EPA Method 3545A). If Aroclor analysis is performed using Method 8082A, clean up steps of the extract shall be performed as necessary to remove interference and to achieve as close to a limit of detection of 0.11 mg/kg as possible. Reporting protocol, consistent with s. NR 106.07(6)(e), should be as follows: If all Aroclors are less than the LOD, then the Total PCB Dry Wt result should be reported as less than the highest LOD. If a single Aroclor is detected then that is what should be reported for the Total PCB result. If multiple Aroclors are detected, they should be summed and reported as Total PCBs. If congener specific analysis is done using Method 8082A, clean up steps of the extract shall be

performed as necessary to remove interference and to achieve as close to a limit of detection of 0.003 mg/kg as possible for each congener. If the aforementioned limits of detection cannot be achieved after using the appropriate clean up techniques, a reporting limit that is achievable for the Aroclors or each congener for the sample shall be determined. This reporting limit shall be reported and qualified indicating the presence of an interference. The lab conducting the analysis shall perform as many of the following methods as necessary to remove interference:

3620C – Florisil	3611B - Alumina
3640A - Gel Permeation	3660B - Sulfur Clean Up (using copper shot instead of powder)
3630C - Silica Gel	3665A - Sulfuric Acid Clean Up

4.6.7 Annual Land Application Report

Land Application Report Form 3400-55 shall be submitted electronically by January 31, each year whether or not non-exceptional quality sludge is land applied. Non-exceptional quality sludge is defined in s. NR 204.07(4), Wis. Adm. Code. Following submittal of the electronic Annual Land Application Report Form 3400-55, this form shall be certified electronically via the 'eReport Certify' page by a principal executive officer, ranking elected official or duly authorized representative. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

4.6.8 Other Methods of Disposal or Distribution Report

The permittee shall submit electronically the Other Methods of Disposal or Distribution Report Form 3400-52 by January 31, each year whether or not sludge is hauled, landfilled, incinerated, or exceptional quality sludge is distributed or land applied. Following submittal of the electronic Report Form 3400-52, this form shall be certified electronically via the 'eReport Certify' page by a principal executive officer, ranking elected official or duly authorized representative. The 'eReport Certify' page certifies that the electronic report form is true, accurate and complete.

4.6.9 Approval to Land Apply

Bulk non-exceptional quality sludge as defined in s. NR 204.07(4), Wis. Adm. Code, may not be applied to land without a written approval letter or Form 3400-122 from the Department unless the Permittee has obtained permission from the Department to self approve sites in accordance with s. NR 204.06 (6), Wis. Adm. Code. Analysis of sludge characteristics is required prior to land application. Application on frozen or snow covered ground is restricted to the extent specified in s. NR 204.07(3) (l), Wis. Adm. Code.

4.6.10 Soil Analysis Requirements

Each site requested for approval for land application must have the soil tested prior to use. Each approved site used for land application must subsequently be soil tested such that there is at least one valid soil test in the four years prior to land application. All soil sampling and submittal of information to the testing laboratory shall be done in accordance with UW Extension Bulletin A-2100. The testing shall be done by the UW Soils Lab in Madison or Marshfield, WI or at a lab approved by UW. The test results including the crop recommendations shall be submitted to the DNR contact listed for this permit, as they are available. Application rates shall be determined based on the crop nitrogen recommendations and with consideration for other sources of nitrogen applied to the site.

4.6.11 Land Application Site Evaluation

For non-exceptional quality sludge, as defined in s. NR 204.07(4), Wis. Adm. Code, a Land Application Site Request Form 3400-053 shall be submitted to the Department for the proposed land application site. The Department will evaluate the proposed site for acceptability and will either approve or deny use of the proposed site. The permittee may obtain permission to approve their own sites in accordance with s. NR 204.06(6), Wis. Adm. Code.

4.6.12 Class B Sludge: Fecal Coliform Limitation

Compliance with the fecal coliform limitation for Class B sludge shall be demonstrated by calculating the geometric mean of at least 7 separate samples. (Note that a Total Solids analysis must be done on each sample). The geometric mean shall be less than 2,000,000 MPN or CFU/g TS. Calculation of the geometric mean can be done using one of the following 2 methods.

Method 1:

Geometric Mean = $(X_1 \times X_2 \times X_3 \ldots \times X_n)^{1/n}$

Where X = Coliform Density value of the sludge sample, and where n = number of samples (at least 7)

Method 2:

Geometric Mean = antilog$[(X_1 + X_2 + X_3 \ldots + X_n) \div n]$

Where X = $\log_{10}$ of Coliform Density value of the sludge sample, and where n = number of samples (at least 7)

Example for Method 2

Sample Number	Coliform Density of Sludge Sample	$\log_{10}$
1	6.0×10^5	5.78
2	4.2×10^6	6.62
3	1.6×10^6	6.20
4	9.0×10^5	5.95
5	4.0×10^5	5.60
6	1.0×10^6	6.00
7	5.1×10^5	5.71

The geometric mean for the seven samples is determined by averaging the $\log_{10}$ values of the coliform density and taking the antilog of that value.

$(5.78 + 6.62 + 6.20 + 5.95 + 5.60 + 6.00 + 5.71) \div 7 = 5.98$

The antilog of $5.98 = 9.5 \times 10^5$

4.6.13 Class B Sludge: Anaerobic Digestion

Treat the sludge in the absence of air for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 15 days at 35° C to 55° C and 60 days at 20° C. Straight-line interpolation to calculate mean cell residence time is allowable when the temperature falls between 35° C and 20° C.

4.6.14 Vector Control: Volatile Solids Reduction

The mass of volatile solids in the sludge shall be reduced by a minimum of 38% between the time the sludge enters the digestion process and the time it either exits the digester or a storage facility. For calculation of volatile solids reduction, the permittee shall use the Van Kleeck equation or one of the other methods described in "Determination of Volatile Solids Reduction in Digestion" by J.B. Farrell, which is Appendix C of EPA's *Control of Pathogens in Municipal Wastewater Sludge* (EPA/625/R-92/013). The Van Kleeck equation is:

$$VSR\% = \frac{VS_{IN} - VS_{OUT}}{VS_{IN} - (VS_{OUT} \times VS_{IN})} \times 100$$

Where: VS_{IN} = Volatile Solids in Feed Sludge (g VS/g TS)

VS_{OUT} = Volatile Solids in Final Sludge (g VS/g TS)

VSR% = Volatile Solids Reduction, (Percent)

4.6.15 Class B Sludge - Vector Control: Injection

No significant amount of the sewage sludge shall be present on the land surface within one hour after the sludge is injected.

4.6.16 Class B Sludge - Vector Control: Incorporation

Class B sludge shall be incorporated within 6 hours of surface application, or as approved by the Department.

5 Summary of Reports Due

FOR INFORMATIONAL PURPOSES ONLY

Description	Date	Page
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Operational Evaluation Report	April 30, 2018	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Preliminary Compliance Alternatives Plan	September 30, 2018	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Final Compliance Alternatives Plan	March 31, 2019	19
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Progress Report on Plans & Specifications	December 31, 2019	20
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Final Plans and Specifications	December 31, 2020	20
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Treatment Plant Upgrade to Meet WQBELs	September 30, 2021	20
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Construction Upgrade Progress Report #1	March 31, 2022	20
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Construction Upgrade Progress Report #2	December 31, 2022	20
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Complete Construction	June 30, 2023	20
Water Quality Based Effluent Limits (WQBELs) for Total Phosphorus - Achieve Compliance	July 1, 2023	20
Pretreatment Program Development -Pretreatment Program Development	June 30, 2015	21
Compliance Maintenance Annual Reports (CMAR)	by June 30, each year	23
Industrial User Compliance Evaluation and Violation Reports	Semiannual	33
Pretreatment Program Report	Annually	33
General Sludge Management Form 3400-48	prior to any significant sludge management changes	34
Characteristic Form 3400-49 and Lab Report	by January 31 following each year of analysis	35
Land Application Report Form 3400-55	by January 31, each year whether or not non-exceptional quality sludge is land applied	36
Report Form 3400-52	by January 31, each year whether or not	36

	sludge is hauled, landfilled, incinerated, or exceptional quality sludge is distributed or land applied	
Wastewater Discharge Monitoring Report	no later than the date indicated on the form	22

Report forms shall be submitted electronically in accordance with the reporting requirements herein. Any facility plans or plans and specifications for municipal, industrial, industrial pretreatment and non industrial wastewater systems shall be submitted to the Bureau of Water Quality, P.O. Box 7921, Madison, WI 53707-7921. All other submittals required by this permit shall be submitted to:
South Central Region - Horicon, N7725 HWY 28, Horicon, WI 53032-1060